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THE PSYCHOLOGICAL REVIEW

ERRORS IN THE CRITIQUES OF GESTALT PSYCHOLOGY II. CONFUSED INTERPRETATIONS OF THE HISTORICAL APPROACH

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I

When new conceptions develop in the history of science there inevitably follows a wave of protest. The complaints are invariably the same; there is nothing new in the movement; it lacks evidence; the new conceptions are mysterious and vague. There is even the implication that the new concepts are tinged with an immoral quality. New departures of human endeavor have always been subjected to insinuations of moral opprobrium. At the present time, for example, in psychology, veiled incriminations like the following can be found in the literature: "he [the mechanist] is glad to support any competent worker . . . [but he] pays no attention [to the Gestaltist]. He is too busy, for instance, in studying neurology or biophysics." [1] "There is no great harm, perhaps no harm at all, in such analysis of a man into an operating self [whole] and means through which it operates [parts] provided we do not use it as an excuse for abandoning science." [2] It is

[1] E. L. THORNDIKE, Human learning, The Century Company, 1931, 126. The first article of this series appeared in the PSYCHOL. REV., 1931, 38, 109–138.

[2] E. L. THORNDIKE, The fundamentals of learning, Bulletin of Publications, Teachers College, Columbia University, New York, 1932, 400.

always a question with respect to which side, conservatism or radicalism, such statements are the most relevant. If history repeats itself, as it so often does, the radical is in no grave danger.

In evidence of the contention that new concepts are in reality nothing but old ideas in new clothes, critics of new developments point to history and to conceptions said to be current in the science. But this, too, is a procedure fraught with danger because interpretations of history change with improvements in current ideas. It is the purpose of this paper to inspect the claims, so often made in recent years, that the basic conceptions of *Gestalt* psychology are to be found in James and Titchener, whom we may take as representative of recent history. In later papers the alleged existence of configurational conceptions in current systems of psychology will be inspected, in particular in the systems of Thorndike, Woodworth, McDougall and Spearman.

The discussion which follows hinges around the following points: (1) the lack of thoroughness with which the systematic aspects of psychology are frequently studied; (2) the dangers of abstracting statements from their context; (3) certain basic concepts of *Gestalt* psychology itself, namely, first, differentiation, which affirms that the new differentiates *from the old*; second, the fact that at each step the old, from which the differentiation process comes, changes throughout. Third, since the whole is more than the sum of its parts, specific parts of a new system may be segregated from the whole, and, in the absence of their new context, found to be quite familiar, while at the same time, in their new context, they are quite revolutionary simply because the whole is revolutionary. The part derives its property—its meaning in this case—from the whole. The familiarity, however, is traceable to the fact that the meaning and purpose of the specific point in question are thrown back, by segregating them out of the whole, to a former and more primitive status.

A typical illustration can be found in the case of *form*. Aristotle's conception of form was not at all the *Gestalt* conception, except in the most general sense of the term as

something distinguished from 'content' or 'matter.' Aristotle's form was disembodiable; *Gestalt* form is not. Aristotle's form and matter were not interchangeable; *Gestalt* form and content are interchangeable. Thomas Aquinas emphasized form much after the fashion of Aristotle, but the purpose for which he used the concept was quite different from the modern, more general and relativistic use of the same term. For him, form was meaning; it was not a dynamic space-time configuration. Both Aristotle and Thomas Aquinas began with unity and struggled bravely in an effort to retain it; both assumed differentiation, but in the end locked their unity and plurality into separate boxes at the expense of that differentiation. Thomas Aquinas, for example, conceived of the 'common sense,' following Aristotle, as an agent whose function it was to guarantee a position, in a unified whole, for the contents of five discrete senses. The sense impressions did not, however, *differentiate from* this 'common sense.' They were received by the 'sensorium' from the outside, in such a way that, by the time they were perceived, they were organized. Differentiation was merely a mystical fact, not a principle. It did not explain the organization of the sense impressions after all, for, in the end, that which was originally denied, namely, association, was accepted as the explanation. In other words, from the standpoint of the 'common sense,' there was no association or a putting of parts together. On the other hand, from the standpoint of the sense impressions, either as objects of thought or as perceptions, there was association. This is almost exactly the scheme that James followed, and Titchener's system, in turn, resorts to a similar expedient.

The general contribution of *Gestalt* psychology is that of finding, in its own field, within the limits of present thought and knowledge, a genuine plurality within a genuine unity. It makes differentiation a principle as well as a fact. This could not have been accomplished before generalized relativity had evolved, since differentiation, a consequence of dynamics, presupposes the operation of unified fields where organization is always at a maximum. Further, James and Titchener

followed Aquinas and Aristotle by substituting synthesis for differentiation. We can find no one in the history of science, admitting differentiation as a fact, who did not sacrifice it in the end through no other reason than that of an undeveloped conception of unity, itself. Kant, Hegel, Bosanquet, Bradley, are among the outstanding philosophers who sensed the importance of differentiation, but explained it in the end, mechanistically. Pavlov is a striking example of a modern scientist who, conceding differentiation as a natural process, proceeds to deny it by the derivation of unity from plurality, of organization from chaos, without the scientific evidence to support it. His interpretations are demanded not by his data but by the assumptions with which he commences.

A general contribution to a given field of thought revolutionizes the whole field. Let us contrast James and Titchener with *Gestalt* psychology in order to make more precise the nature of the revolution.

II

There are many pages in James' *Principles of Psychology*, which, abstracted from their context, sound organismic. This is because both James and the organismic psychologist have the same purpose of not violating the principle of unity. However, it is at once obvious that James' purpose of conceiving unity was not the same as the *Gestalt* purpose, except in a most general way. He had an entirely different view of unity. His was wholly the Aristotelian and Aquinian conception, a unity that was not complex, but simple and homogeneous—a strikingly vitalistic conception of wholeness, a whole separable from its parts by means of a whole-part dualism. There was an original unity in the whole, but a derived unity among the parts. The dualism of Aquinas was theologically motivated; in James it was a subject-object dualism. James' subject was a vitalistic agent like the soul of Thomas Aquinas; his objects constituted a machine as did the 'knowns' of Aquinas. Organismic psychology seeks to avoid such a dualism. The difference between James and *Gestalt* psychology arises, therefore, from the fact that James was after all thinking with a mechanistic frame-

work of assumptions; his vitalism was no more than a mechanistic effort to avoid mechanism.

From a systematic standpoint, science faces only those problems which follow from its own assumptions. Psychologists are not divisible into two groups, those who put facts first and systems second and those who put systems first and facts second. On the contrary, they are to be divided into those who admit their systems and inspect their assumptions, and those who do not. James' dualistic problem grew out of his assumption that nature is on the one hand mechanistic and on the other teleological. This dualism, in turn, followed from a general philosophical dualism between mind and matter. His dilemma exhibits itself as early as page 6, Volume I, when he says, "Shall the study of such machine-like yet purposive acts as these be included in psychology?" He is facing the problem of reflexes and instincts, and wonders how they can be aspects of a behavior that is obviously purposive. He struggled long with this assumed dichotomy. Almost tragically, he resorted to dynamic conceptions which would have solved the difficulty for him had he properly defined his dynamics. But the following quotation shows his strictly mechanistic view of dynamics: "Romeo wants Juliet as the filings want the magnet; and if no obstacles intervene he moves towards her by as straight a line as they. But Romeo and Juliet, if a wall be built between them, do not remain idiotically pressing their faces against its opposite sides like the magnet and the filings with the card. Romeo soon finds a circuitous way, by scaling the wall or otherwise, of touching Juliet's lips directly. With the filings the path is fixed; whether it reaches the end depends on accidents. With the lover it is the end which is fixed, the path may be modified indefinitely." [3]

This and the pages which follow in the text tell us why at no time during the two-volume work is James able to include his plurality of objects-thought-of within the unity of the thought. He possessed no conception of how movements

[3] W. James, The principles of psychology, New York: Henry Holt, 1890, Vol. I, 7. (Hereafter referred to as J. I.)

obtain their direction in dynamic fields. He assumed, as did the earlier physicists and as reflexologists now do, that the direction of movement was somehow to be taken for granted. He did not realize that the direction in which the filings moved and the direction in which Romeo moved were both explicable by the same set of principles operating in differently structured fields. It did not occur to him that the direction of physical movement was as much of a 'teleological' phenomenon as the direction of human purposive activity, in other words that under the laws of dynamic, fluid fields, a remote end conditions the present movements. Nor did he know that the same set of principles that explains the direction of movement involves differentiation.

The facts of fluid fields were not available to James. It is no wonder, then, that the difficulty which he encountered at the outset repeated itself in his discussions of the nervous system. Here again he falls back on dynamics, but upon a mechanistic dynamics depending either upon synthesis or upon a *deus ex machina* for final unity. Thus the apparent contradictions in his statements for example, "the normal paths [neural] are only paths of least resistance. If they get blocked or cut, paths formerly more resistant become the least resistant paths under the changed conditions. It must never be forgotten that a current that runs in has got to run out *somewhere*; and if it only once succeeds by accident in striking into its old place of exit again, the thrill of satisfaction which the consciousness connected with the whole residual brain then receives will reinforce and fix the paths of that moment and make them more likely to be struck into again." [4]

Had James known that the dynamics of least resistance presupposed organization among the specific responses of the organism he would not have gone on to explain how that organization was derived piece-meal fashion by a putting of separate responses together through the agency of satisfaction. It is not fair to James to interpret his use of least resistance organismically. It was mechanistic. He tells us that in the latter half of the passage just quoted.

[4] J. I., p. 71.

Again, it is unfair to James if we imply that his notion of ends was organismic. His explanation of ends is mechanistic. End, for James, was a purely empirical concept intended to satisfy the demands of observation. The conception fades as he discusses it. Thus, "All nervous centers have then in the first instance one essential function, that of 'intelligent' action. They feel, prefer one thing to another, and have 'ends.'" [5] The end is derived by a building-up process which relies upon mechanistic association.

Not only were the facts regarding unified fields unavailable for James but we have in his own words indications that, had they been available, they would not have been welcome. The following quotation, for example, when removed from its context, sounds quite organismic, but when we discover what it meant to him the resemblance is only a verbal one. "But what made it [nerve current] ever traverse it [the path] the first time?" [6] Here is the crucial problem. We have in James' own words the evidence that he sensed it. Now listen to the answer, "In answering this question, we can only fall back on our general conception of a nervous system as a mass of matter whose parts, constantly kept in states of different tension, are as constantly tending to equalize their states." [7] Verbally this does sound organismic but we are told in the succeeding sentences what James meant by a mass of parts equalizing their states. It was a mass of discrete reflex arcs to be shifted in a mechanistic juggling process conditioned by so many separate agencies. Not only this, but when in a footnote he quotes Herbert Spencer, who came nearer to an organismic conception than he, he remarks, "I cannot help thinking that Mr. Spencer's data, under a great show of precision, conceal vagueness and improbability, and even self-contradiction." [8] In another footnote on the same page James denies what would have been the approach to an organismic concept of how nerve impulses traverse certain paths for the first time. "We cannot say *the will*,

[5] J. I., p. 79.
[6] J. I., p. 109.
[7] J. I., p. 109.
[8] J. I., p. 109.

for . . . no action . . . can be *primarily* such . . . the voluntary action must [originally] . . . have been impulsive or reflex." [9] *Had James admitted that the will could have directed the nerve impulse* along a certain path, defining will as a dynamic field property of the brain mass, *his answer would have been organismic.*

In his chapter on 'The Automaton-Theory,' James begins his fight against atomism in earnest.[10] He is seeking for some loophole within the facts of his time permitting consciousness more than the status of an epiphenomenon. But he admits his difficulty and, in so doing, again denies what could have been an organismic concept: "there is, it must be confessed, still another highly abstract reason for denying causal efficacity to our feelings. We can form no positive image of the *modus operandi* of a volition or other thought affecting the cerebral molecules." [11] Under organismic concepts, feelings, as the phenomenal properties of the dynamic field of which the 'cerebral molecules' are parts, *can* affect the parts themselves, and presumably do, under the law of determined action. Remember that we do not, in terms of organismic principles, commence with dualistic assumptions. James wanted badly to believe that feelings were efficacious. "It is to my mind quite inconceivable that consciousness should have *nothing to do* with a business which it so faithfully attends." [12] While he was unwilling to answer the question in terms of a 'binding' process, he never furnished a substitute. Instead, he ends by making consciousness a *deus ex machina.* It loads the dice by intervening 'when nerve processes are hesitant'—a sheer vitalism.[13] ". . . the study *a posteriori* of the *distribution* of consciousness shows it to be exactly such as we might expect in an organ added for the sake of steering a nervous system grown too complex to regulate itself." [14]

The mechanistic point of view of which vitalism is merely

[9] J. I., p. 109.
[10] J. I., p. 132.
[11] J. I., p. 135.
[12] J. I., p. 136. For the law of determined action see Wheeler and Perkins, Principles of mental development, New York: Crowell, 1932, 21.
[13] J. I., p. 142.
[14] J. I., p. 144.

a part will express itself in so much literalness sooner or later ". . . just as the material atoms have formed bodies and brains by massing themselves together, so the mental atoms, by an analogous process of aggregation have fused into those larger consciousnesses which we know in ourselves and suppose to exist in our fellow-animals. Some such doctrine of *atomistic hylozoism* as this is an indispensable part of a thorough-going philosophy of evolution." [15] And James spent pages fighting atomism!

The relationship of neural processes to conscious states was a difficult problem for James. He seems to regard integration as a process going on below the threshold of consciousness and when the summative or synthetic effects of various impulses reach a given maximum as, for example, in perceiving a tone, there takes place "some rather massive and slow process of tension and discharge in the cortical centres, to which, *as a whole*, the feeling of musical tone . . . *simply and totally* corresponds." [16] Here James intends to preserve a genuine unity of the perceptual process by making it an adjustment to a mass of neural events whose integration has been built up at the physical level. His logic is in this case primarily that which he uses later in distinguishing between thought and the objects thought of. We can hardly lay stress upon his insistence that feelings do not mix to form feelings when, in the next breath, he permits complex physical activities to be formed by mixing simple physical activities together.

Again, James' dilemma hinges upon a mechanistic conception of physical nature, wherein unity is admitted, not in the nature of things themselves but in mysterious relations between them. "The 'water' is just the old atoms in the new position, H–O–H; the 'new properties' are just their combined *effects*, when in this position, upon external media . . . ." [17] Then he quotes from Royce to the effect that aggregations are organized wholes only when they behave as such in the presence of other things. Unity is only an

[15] J. I., p. 149.
[16] J. I., p. 156.
[17] J. I., p. 159.

'as if,' a universal epiphenomenon. Thus James once more denies an organismic concept of nature. We have already noted that he accepted an atomistic hylozoism in regard to the feelings and the physical world alike. There can be no self-compounding, no synthesis, "Nothing is but the everlasting atoms." [18] Notice the confusion which this position creates later: "The total brain-process is composed of parts, of simultaneous processes in the seeing, the hearing, the feeling, and other centres." [19] "The '*entire brain-process*' *is not a physical fact at all.* . . . On the principles of . . . mechanical philosophy, the only realities are the separate molecules. . . . Their aggregation into a 'brain' is a fiction of popular speech." [20] The total brain process is admitted and then denied. James was not satisfied with all this to be sure. He was struggling with the inadequate scientific theories of his time. "What shall we do?" he asks. How can a unified mind be related to a chaos of brain-parts when 'higher synthesis' is but 'spiritual chloroform'? He concludes: "Better live on the ragged edge, better gnaw the file forever!" [21] Mental processes are the outside concomitants of 'an entire brain process' which, although a total, has no unity. They are the media upon which the manifold brain processes combine their effects.

We have seen that James conceded synthesis in his acceptance of hylozoism, then both denied and accepted it in connection with physical events. His quarrel and vacillation with synthesis were short lived. Thus, ". . . sensations came to us . . . combined into 'things.'" [22] ". . . a deaf and dumb man can weave his tactile and visual images into a system of thought. . . ." [23] This position compels him at once to face the association problem. In order not to ruin the unity of mind by a synthesis which is still distasteful, he is forced into a dualism of subject and object where unity

[18] J. I., p. 161.
[19] J. I., p. 178.
[20] J. I., p. 178.
[21] J. I., p. 179.
[22] J. I., p. 233.
[23] J. I., p. 266.

resides in the thought as subject and plurality in the objects of the thought. This effort to avoid synthesis leads to self-contradictions in James' own language, "If not thought with each other, things are not thought in relation at all." [24] He admits, then, that each object must be conceived in its own individual way by a discrete pulse of thought. The subject, after all, possesses the same plurality as exists among the objects. The objects are put together. Separate things mean separate thoughts as much as they do separate things. Thus, when we read a statement like, ". . . each thought is a fresh organic unity, *sui generis*," [25] we read, not an organismic statement, but a vitalistic one in which the unity of the thought is something simple like the soul of the ancients. The thought is in reality a unit only as the parts have been put together in the form of objects. All the while the thought, as subject, possessed no parts; it was never a differentiable thing, and yet the objects themselves were mental. James has temporarily avoided synthesis again. Shortly it will return.

There has been much misunderstanding concerning the part which James' 'stream of consciousness' played in his system. In this connection, his concept of unity went no farther than that of continuity. He had no conception of what is meant by a configuration. Here, James' whole problem was to avoid assuming that consciousness is discontinuous when its content is discontinuous. How unity could be perceived in such a situation was a problem too difficult for James to solve. A given state of consciousness must 'inherit' a unifying principle from its predecessors and pass the inheritance on to its successors. In many places we are given the impression that the unifying thought was a kind of stationary sieve through which the stream of consciousness must find its way and by means of which the objects of the thought become ordered in time as well as in space. There is synthesis after all. "The thinking them [the objects of thought] is *thinking* them together. . . . This

[24] J. I., p. 277.
[25] J. I., p. 279.

sort of *subjective synthesis*, essential to knowledge as such . . . must not be confounded with *objective synthesis* or union. . . ." [26] Is not synthesis synthesis whether mental or physical?

The parts of the thought may be different from one time to the next but "under all their differences they are knit in these two ways; and if either way of *knitting* disappears, the sense of unity departs." [27] What is this knitting? We may paraphrase James' position as follows: the mental processes as objects stick together by sticking severally to the unifying thought.[28] In subsequent pages it becomes clear just what this relationship is between the thought and its objects. "The Thought does not capture them [the objects], but as soon as it comes into existence it finds them already its own." [29] Then, 'the title of a collective self' is somehow 'passed from one Thought to another' in order to preserve continuity in the stream of consciousness.[30] What could be more mystical and more vitalistic? The end comes with a denial that the whole is more than the sum of its parts and with the acceptance of a chaotic pluralism. Once more in facing the problem of the whole, James' aversion for synthesis leads him into a self-contradiction because the organismic substitute was not available. "We do not answer the question 'What is that more?' when we say that it is a 'Soul' which the brain-state affects. This kind of more [the Thought] *explains* nothing. . . . I find the notion of some sort of an *anima mundi* thinking in all of us to be a more promising hypothesis . . . than that of a lot of absolutely individual souls." [31] But this is precisely what James has. His thoughts are an aggregate of individual 'souls,' absolutely separate and individual thoughts possessing a mysterious relationship whereby they pass on from one to another a common factor necessary for the unity of the mind-as-a-whole.

[26] J. I., p. 331.
[27] J. I., p. 336 (italics ours).
[28] J. I., p. 337.
[29] J. I., p. 338.
[30] J. I., p. 339.
[31] J. I., p. 346.

James' real assumptions are contrary to his statements. He denied a whole that was more than the sum of its parts whether we call it soul or not, and then confessed, "*Its* successive thoughts are the only intelligible and verifiable things about *it*." [32] He grants the soul's existence twice in the same sentence, by using 'it' twice.

All through the chapter on 'The Consciousness of Self,' we find facts and arguments, alike, intended to prove the impossibility of what today would be called a field property of the mind-as-a-whole, that is, a self. For example, "Taine means by 'each of us' merely the present 'judging Thought' with its memory and tendency to appropriate, but he does not name it distinctly enough, and lapses into the fiction that the entire series of thoughts, the entire 'plank,' is the reflecting psychologist." [33] Dozens of such denials of the very basis of organismic psychology can be found in the two volumes. It is in this chapter on the self that James tells us precisely what his non-organismic conception of unity is, and in comes synthesis again. "In the function of knowing there is a multiplicity to be connected, and Kant brings this multiplicity inside the mind. . . . We, on the contrary, put the Multiplicity with the Reality outside, and leave the mind simple. Both of us deal with the same elements—thought and object—the only question is in which of them the multiplicity shall be lodged. Wherever it is lodged it must be 'synthetized' when it comes to be thought. And that particular way of lodging it will be the better, which, in addition to describing the facts naturally, makes the 'mystery of synthesis' least hard to understand." [34]

Note how James presupposes the primary existence of parts in spite of the fact that he talks about unity, and notice the difficulty this brings with it. "Our Thought is not composed of parts, however so composed its objects may be. There is no originally chaotic manifold in it to be reduced to order." [35] The only reason why there is no chaotic manifold

[32] J. I., p. 350 (italics ours).
[33] J. I., p. 355.
[34] J. I., p. 363.
[35] J. I., p. 363.

in the Thought is the fact that for James the Thought is a simple, homogeneous whole having no plurality and no differentiation, but there is a chaotic manifold in the objects of the thought which must be reduced to order by the conventional means, namely, association. "*There need never have been a quarrel between associationism and its rivals if the former had admitted the indecomposable unity of every pulse of thought, and the latter been willing to allow that 'perishing' pulses of thought might recollect and know.*" [36] And thus the 'I' becomes a judging thought and parts must do the work of the whole.

From here on it is easy to see why there was a rapid decline in James' emphasis upon unity, and a frank return to synthesis. Unity must be preserved by association and also by attention. "*Association*, so far as the word stands for an *effect, is between* THINGS THOUGHT OF—*it is* THINGS, *not ideas, which are associated in the mind.* We ought to talk of the association of *objects*, not of the association of *ideas.*" [37] And yet the awareness of an object is professed to be a mental phenomenon. Merely an imaginary line drawn sharply between subject and object within the one medium, mental life, is the alleged agent which saves psychology from machinism. The inadequacy of such a position is too obvious to discuss further.

In Volume II, in the chapter on Sensation, James' problem is laid down at once "that sensations are *first* things in the way of consciousness." [38] What are these sensations? We have the answer shortly. "*The first sensation that an infant gets is for him the Universe.*" [39] But again the whole implied by James is not the type of whole which is affirmed by *Gestalt* psychology. To be sure, "*it has objectivity, unity, substantiality, causality, in the full sense in which any later object or system of objects has these things.*" [40] But, these are

[36] J. I., p. 371.
[37] J. I., p. 554.
[38] W. JAMES, The Principles of Psychology, New York, H. Holt, 1890, Vol. II, 6. (Hereafter referred to as J. II.)
[39] J. II., p. 8.
[40] J. II., p. 8.

not organismically differentiated wholes; they are universals on the order of concepts which in themselves will not differentiate because they are homogeneous and simple, in other words, elements. These general elements have played important rôles in many a system of psychology and philosophy. They constitute a plurality in their own right which, as in the system of Thomas Aquinas, must be organized by means of synthesis. They are parts which come first and must be combined. They are so in James.

If there is any place in James where one would like to credit him with a true organismic conception it is in the following quotation which he borrows from Martineau: "To this original Unity of consciousness it makes no difference that the tributaries to the single feeling are beyond the organism instead of within it, in an outside object with several sensible properties, instead of in the living body with its several sensitive functions. . . . The unity therefore is not made by 'association' of several components; but the plurality is formed by *dissociation* of unsuspected varieties within the unity; the substantive thing being no product of synthesis, but the residuum of differentiation." [41] To James, this statement meant very little. The one confused fact implied in an original sensation, he admits, is perceived later to be many facts and to contain many qualities. But these facts and qualities *do not emerge through differentiation.* It is not the judging Thought that differentiates. Objects are found already differentiated, that is all. And this is what Martineau meant as well. An intensive study of Martineau's writings indicates that he, too, confused the issue by making unity simple and plurality complex and separated from it. Synthesis, always the trouble maker, is sidetracked once more by a denial and by a dualism between unity and plurality. The farce must be re-enacted of dragging it in again.

All this is brought out later when, facing the problem of how sensations, at first simple, turn out to be complex, James casts about for a principle. Instead of using the concept of differentiation which he quoted from Martineau and which

[41] J. II., p. 9.

neither he nor Martineau understood, he resorts to Lewes' term 'assimilation,' characterizing it as 'the most fruitful one yet used.'[42] Assimilation always means, and meant for James, the process of starting with parts whose previous, independent existence is presupposed. Then the parts are put together. Thus, in his discussion of space perception, he says that the first awareness of space is that of a "simple total vastness, in which *primitively* at least, no *order of parts* or of *subdivisions* reigns."[43] This total vastness, like the *Gestalt-qualität*, is a mental element not having parts because it is simple and undifferentiable. Accordingly "the primordial largenesses which sensations yield must be *measured and subdivided* by consciousness, and *added* together, before they can form by their synthesis what we know as the real Space of the objective world."[44] And so the question, "*How do we* ARRANGE *these at first chaotically given spaces into the one regular and orderly 'world of space' which we now know?*"[45] becomes all important. Notice that just previously, we had no ordering of parts, no chaos on the side of subject. On the side of objects, however, we do. It is curious that James should have denied the problem on the one hand and have accepted it on the other without realizing that in both places it was the same problem. He did it in an abortive effort to avoid synthesis.

"That a sensation *be discriminated as a part* from out of a larger enveloping space. . . ."[46] What a beautifully organismic statement if we accept the words at their face value, but in so doing we read meaning into the statement that James did not intend, indeed that he flatly opposed. He gives his true position away in the next sentence. "The problem of ordering our feelings in space is . . . not of discrimination pure and simple; for then not only coexistent sights but coexistent sounds would necessarily assume such order, which they notoriously do not."[47] For James the

[42] J. II., p. 107.
[43] J. II., p. 145.
[44] J. II., p. 145.
[45] J. II., p. 146.
[46] J. II., p. 147.
[47] J. II., p. 147.

space world was originally a chaos of undifferentiated wholes, namely, simple mental elements. It was not a differentiable field wherein complexity and unity exist in a truly monistic fashion. "*The bringing of subdivisions to consciousness constitutes, then, the entire process by which we pass from our first vague feeling of a total vastness to a cognition of the vastness in detail.*" [48] The consciousness to which the sensations are brought is undifferentiable, exactly the sort of thing that James ridiculed in Kant. The subdivisions which are brought to consciousness are a hodgepodge of unorganized impressions each with its own local sign. Thus the problem, more specifically, becomes "*How do their* [subdivisions] *mutual addition and fusion and reduction to the same scale, in a word, how does their synthesis, occur?*" [49] Synthesis finally loses its terrors and is not used, now, with quotes around it. The dye is cast; the primacy of chaos is admitted, and many pages are devoted to the effort of finding principles by means of which order can be brought out of this chaos. ". . . the first fact that appears is that *primitively our space-experiences form a chaos, out of which we have no immediate faculty for extricating them.*" [50] "*How is the chaos smoothed and straightened out?*" [51] Attention and association do it. "*Whatever sensible data can be attended to together we locate together.*" [52] By this means parts become unified into wholes. This is quite satisfactory to James, after he has sought the aid of local signs. He has deliberately employed synthesis and yet association, attention, blending like into like, do not raise the question of "any mysterious 'mental chemistry' or power of 'synthesis' to create elements absent from the original data of feeling." [53] Of course not. James has denied that the whole is more than the sum of its parts, therefore, synthesis holds no horrors. It is after all an empty term. We can expect nothing more in James on the order of a fight against atomism, and there is no

[48] J. II., p. 152.
[49] J. II., p. 166.
[50] J. II., p. 181.
[51] J. II., p. 183.
[52] J. II., p. 183.
[53] J. II., p. 203.

further fight. Behavior is divided into instincts, the volitional consciousness into will-elements and ideo-motor activities, and the emotions into organic sensations.

III

We now turn to Titchener.

Titchener's psychology can be adequately understood only when the assumptions that color his entire system have been deliberately inspected. First among these is the assumption that the science of psychology is a purely descriptive discipline, a structuralism, a strict phenomenology. Functional problems were in the main relegated either to logic or to physiology. Second, Titchener was dualistically minded and dualisms saturate his writings. He was a parallelist in his stand on the mind-body problem and he separated description and interpretation into a sharp dichotomy, process and meaning. Third, he was a dualist with respect to the problem of description, postulating two types of units in mental life, the genetic and the analytic. And fourth, he was a thorough-going mechanist in his logic.

At the outset Titchener informs us that the subject matter of psychology "is the sum-total of human experience considered as dependent upon the experiencing person." [54] Recently, there has been a disposition to think, because Titchener made experience depend upon a person, that he recognized the primacy of the whole and was thus configurational. This is hardly true. The dependence of mind upon an experiencing person was for Titchener merely an empirical fact demanded by common sense. It was not a principle, and is at no time employed in the mechanics of his system. Indeed, as in James, we find several assertions flatly denying the suppositions that would have made him a configurationist. For example, we read "to suppose that the sorrow and the fear are literally the cause of tears and bodily movements would be on a par with supposing that the idea of watering the lawn can, literally and directly, turn the tap and set the sprinkler in motion." [55] This is precisely what

[54] E. B. TITCHENER, A text-book of psychology, New York: Macmillan, 1913, 9. (Hereafter referred to as T.)

[55] T., p. 15.

the idea of watering the lawn actually does under organismic assumptions. The whole conditions the activities of its parts and the idea is an efficacious property of the unified, active organism.

The problem of psychology, according to Titchener, is to ascertain how the elements of mental life are combined and arranged.[56] And further, "to answer the question 'how' is the task of synthesis." [57] But this can be accomplished only after mind has been reduced to its simplest components. When the scientist has found the elements "which cannot be reduced, even in part, to other processes" [58] he proceeds to formulate 'their laws of connection.' Titchener's strict mechanism appears in the positiveness with which he presupposes part to part causation. "If sensations of color occur side by side they enhance one another" and "if sensations of tone occur together they blend or fuse." [59] However, Titchener realized the limitations of his whole psychology when he said "reference to the nervous system introduced into psychology just that unity and coherence which a strictly descriptive psychology cannot achieve." [60] It is curious that he admitted into neurology the functional principles necessary for an understanding of 'unity and coherence' but denied them to psychology. Obviously, if a functionalism is wrong in one science it must also be wrong in another, for that which makes it wrong is not the content of the science but a number of supposed systematic difficulties. Titchener was not willing to impose these alleged difficulties upon psychology but quite willing to impose them upon neurology. Could Titchener be called a configurationist when psychology, as such, cannot achieve unity and coherence?

With elementarism established by assumption, we pass on to sensation and are given a vigorous warning "if we now pass as elementary any process that is really complex we are guilty of a sheer blunder, and shall pay for it later on." [61]

[56] T., p. 36.
[57] T., p. 37.
[58] T., p. 38.
[59] T., p. 38.
[60] T., p. 39.
[61] T., p. 46.

Titchener paid for his elementarism and again precludes the configurational position which consistently denies the existence of elements.

A serious inconsistency creeps into Titchener's treatment of elements. We are warned that they are abstractions, "but they are still real processes, still actual items of mental experience." [62] In spite of this statement many defenders of Titchener's system insist that for him the elements were not real, but only methodological, tools. Throughout the chapters on sensation, we are told indirectly again and again that parts are primary, a fact that rules Titchener completely out from the ranks of the configurationist. Accordingly, we must expect the usual type of associationism, logically at least, and so we find it. In his discussion of movement we read, "What happens is that a complex of articular sensations becomes associated, with constant repetition, to a visual perception of a movement." [63] Again, no one with a grasp of configurational principles could, in treating synæsthesia, regard the so-called secondary sensation as a concomitant or associational appendage, but this is precisely Titchener's view.[64]

His atomism is very thoroughgoing. ". . . consciousness may be a mosaic of separate pleasantnesses and unpleasantnesses." [65] His atomistic position does not permit him a configurational definition even of meaning, while, to be sure, in a context, one mental process accrues to another through the situation in which the organism finds itself. This context is derived mechanistically by a building-up process whereby image supervenes upon sensation and elements get put together.[66] ". . . it takes at least two sensations to make a meaning." [67] Nor can we find Titchener configurational in the following quotation. ". . . be clear that the account is not genetic, but analytic. We have no reason to believe that

[62] T., p. 50.
[63] T., p. 167.
[64] T., p. 194.
[65] T., p. 235.
[66] T., p. 367.
[67] T., p. 368.

mind began with meaningless sensations, and progressed to meaningful perceptions . . . we must suppose that mind was meaningful from the very outset." [68] Those who regard such statements as organismic fail to read far enough down the page. From a genetic point of view unity is admitted, but from what source is it derived? The original meanings in mental life were groups of sensations which the organism "selects, unifies, focalises, supplements, and, if need be, acts upon" in terms of inherited organization, or, in other words, by instincts.[69] The problem of unity is not solved; it is merely pushed back to the nervous system where, if Titchener were consistent, he would duplicate his atomism. Meaning comes about "under the general laws of attention and the special laws of sensory connection" whereby "sensations are welded together, consolidated, incorporated into a group." [70] Furthermore, meaning in its earliest form was "some sensory complex in a kinæsthetic setting. Then comes the invasion of consciousness by images, which modify both complex and setting, and may, in course of time, largely replace the sensory elements of the one and actually displace the other." [71]

As Titchener draws his chapter on meaning to a close we find a denial of configurational assumptions at the expense of a serious self-contradiction. He vigorously disagrees with Stout that the whole is more than the sum of its parts. ". . . this attitude betrays a confusion of the analytic and the genetic points of view. We cannot generate the square from lines, or the melody from rhythm and scale; but neither is that what we try to do. . . . Our psychological task is to analyze these given perceptions, to discover their elements, and to formulate the laws under which the elementary processes combine. That done, we can write, for 'square' and 'melody,' 'these and these elements connected in these and these uniform ways.' . . . We have solved our problem in analytical terms; we have not first defined the terms, and

[68] T., p. 369.
[69] T., p. 369.
[70] T., p. 371.
[71] T., p. 371.

then put them together to produce something that was not contained in the definition." [72] The contradiction lies in admitting that we cannot generate the square from lines, at the same time actually admitting that very thing. The synthetized elements are equivalent to the square. He has done that which he said he would not do. He has defined terms and put them together to produce something not contained in the definition, in assuming that the synthetic product is equivalent to the whole. He has nothing but elements. These are the terms, by definition. They are then put together, and something not contained in the terms is admitted, both the experience of squareness and the process of deriving it by means of synthesis from qualities not contained in the elements. Titchener's error was his original distinction between the analytic and the genetic unit. In configurational psychology there are not two kinds of units and there is *no* synthesis. The genetic and analytic units are the same. The proper scientific methods do not reverse the processes of nature as Titchener reversed them.

Titchener's discussion of association harbors another repudiation of configurational concepts. "And if we observe associations under experimental conditions, we find that they hinge, in reality, not upon the ideas as wholes, but upon some simple constituent of the ideas. This point established, we may go on to the mode of elementary connection. The first stage, the fusion of like with like, becomes clear if we translate it into physiological terms. When a complex stimulus is presented to the organism, it arouses a complex excitation in the brain. But some at least of the component stimuli have impressed the brain in the past. These stimuli, then, running into the paths of previous impression, reexcite a previous brain-activity; the other, new stimuli have to make their impression for themselves." [73] Thus, the analytical unit is, after all, the genetic one. Ideas as wholes have no efficacy even in the beginning.

What did Titchener mean, then, when he wrote, at the

[72] T., p. 372.
[73] T., p. 393.

expense of self-contradiction, that the psychological elements were not chronologically the first things in mind and that perceptions do not grow by the interconnecting of separate sensations?[74] Apparently Titchener felt somehow, that all science was artificial, that synthesis could not give us a correct account of nature, but to give an artificial account was the best we could do. Could there be any better proof that Titchener did not conceive of configurational principles? Light is thrown upon this consequent discrepancy in his treatment of pure and mixed perceptions. ". . . the mere enumeration of these sensations is not an accurate account of perception."[75] "They form not a whole but a group" and that which is lacking in the account is filled in by having recourse to attention. In other words, logically, the incomplete account must be supplemented as in case of all mechanisms by means of a vital agent or *deus ex machina.* Certainly the recognition that elements do not exhaust the account of perception, did not lead Titchener to the configurational standpoint. His supplementary function was an agent like attention, instead of a macroscopic principle conditioning the activity of the parts. Moreover Titchener himself has just denied the 'whole' once more.

Thus, Titchener solves the problem of unity and plurality as Aristotle did, as Thomas Aquinas did, and as James did. 'Togetherness' is merely found; it is not a principle. Unity is something recognized but not used and, just as James confined his unity to a compartmentalized subject in the form of a Thought, Titchener compartmentalized his unity in the genetic unit which he first admits and then denies.[76]

[74] T., p. 350.

[75] T., p. 364.

[76] A study of Titchener's Prolegomena to a Systematic Psychology, Macmillan, 1929, shows that his point of view had not changed, essentially, from 1913. Scientific method proceeds from the simple to the complex, element to compound (p. 28); observation comes first, logic and hypothesis second. There are indications that Titchener sensed the fallacy of this position but did nothing about it. (*Cf.* his single quotes in "science is 'logically prior' to the methods of logic," p. 48.) Synthesis is the final problem of science; the sciences are discrete and separate, not only in their content, but in their principles (73), thus denying a generalized relativity and transposability of principle upon which configurational concepts are based; there is little

IV

There are certain important observations to be made in connection with our discussion of James and Titchener. First, unity and plurality were compartmentalized, which explains why unity was a fact instead of being both a fact and a principle. There is assumed in these, and apparently in all previous attempts to handle the problem of the one and the many, a dualism and an interaction; the many act upon the one. Primitive responses are pluralistic and unorganized; they are impressed upon some simple and homogeneous entity like a soul, a judging Thought, a genetic unit, a native form which in itself never differentiates. Instead, it finds, superimposed upon it, a layer of experiences or objects that come to it already differentiated. The act of responding does not involve the act of differentiating; the response merely selects, picks, chooses, and juggles. Differentiation and selection are by no means synonymous. *In the first case the plurality is the result of the process; in the second the plurality is given to the process from outside.*

It should be clear, therefore, what the contribution of the *Gestalt* movement in psychology has been. The contribution is not an isolated one; other scientists in other fields have made the same discovery. That it is the consequence of an evolutionary process in no way detracts from its importance in psychology. Previous to the organismic and relativity movement in human thought, everyone seemed to be thinking in terms of a dualism between unity and plurality which we have found so clearly exemplified in James and Titchener. It was the same in Kant. The problem of the many in the one

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hope of the unification of the sciences (75); differentiation as a principle is denied in assuming that science cannot be 'perfected common sense' (48); psychology is still blocked off from science in general; the naïve position is assumed that the facts of immediate experience need no logical control as do the facts of natural science (109); conceptual reconstruction has no part in psychology (109; a naïve empiricism now being abandoned in science because of its demonstrated fallacies); and there remain essentially his older inconsistencies such as granting functional problems to physics and biology and denying them to psychology (266). In the end he is not satisfied. He has not found a place for consciousness. The solution must be deferred (265). These basic views amounted, still, to a repudiation of *Gestalt* principles. With his assumptions he could not have sensed what the new movement was all about.

could not be solved until there had been conceived a relativistic situation in which all parts are mutually dependent, where principles are transposable, and where organic unity, in the form of a macroscopic principle, is presupposed.

Unquestionably, the solution still remains incomplete. It is, merely, one more step toward a better understanding of nature. Nevertheless, it is probable that the *Gestalt* movement will continue for some time to have leveled against it criticisms whose answers are already explicit in the system, but which have been ignored.

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SIGN-GESTALT OR CONDITIONED REFLEX?[1]

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The general fact that specific acts tend to be learned or not learned according to the 'goodness' or 'badness' of their consequences is an empirical generalization with which, I suppose, we would now all agree. Our disputes will arise not with respect to this empirical fact but rather with regard to the hypotheses we would adopt for its underlying explanation. The 'trial-and-error' psychologists would explain this influence of consequences upon the learning by their laws of 'effect.' They would say that those stimulus-response connections which are followed by 'good' effects, whether these latter be conceived as pleasure, increased sensory consequences, or what not, will be strengthened, whereas those which are followed by 'bad' effects will be weakened. And they will hint at various neurological concepts to explain this back-action of effects upon learning. But it is not this trial-and-error doctrine, in any of its forms, in which I am interested here. Rather I wish now to draw your attention to a conditioned response doctrine of consequences.

At first blush it might seem that the conditioned response psychologists could have no doctrine of consequences. For in their original and pristine statement they seem to assert that a response gets learned (*i.e.*, attached to a new stimulus) in so far as that new stimulus has been presented enough times preceding or just simultaneously with an original stimulus. Good or bad consequences do not come into the picture. It is the mere concatenation of the two stimuli which does the work. And yet the conditioned response psychologists, at least those in this country, do have a doctrine of consequences. And one can but admit that they,

[1] Read before the American Psychological Association, Ithaca, New York, September 8, 1932.

in achieving it, have been both 'as wise as serpents and as harmless as doves.' For they have invented a way of allowing for the different effects of good and bad consequences and yet at the same time of apparently still adhering to their original *bona fide* conditioning principles. Let me illustrate in terms of a concrete experiment.

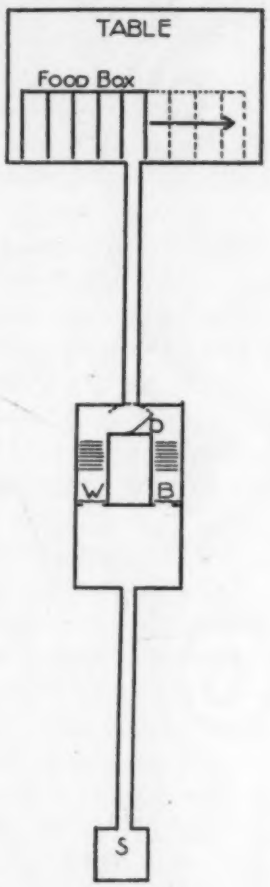

FIG. 1.

Figure 1 shows the ground-plan of a discrimination-box similar to one which I have been recently using. B and W are black and white curtains hanging just behind the two exits from the choice-box. They are interchangeable. The task is always to choose the white curtain. D is a door which

in each trial is so placed that, if the animal chooses the white curtain he gets to the food, whereas, if he chooses the black he runs into a blind alley and also he can be given an electric shock in this blind alley. How do our conditioned response friends explain such a discrimination-learning?

They argue somewhat as follows. Learning consists in conditioning a positive response to the white curtain and a negative response to the black curtain. The rat learns to enter the door which, in the given trial, has the white curtain behind it because this white-curtained door, as stimulus, is followed by a free open path and by food. And to such free open path and food the positive responses of approach and of eating are already attached. That is, the unconditioned positive responses which the animal makes to the food or to the free open path get conditioned back to the stimulus, white-curtained door, which always precedes them. Similarly the rat learns *not* to enter the black-curtained door because this latter, as stimulus, is always followed by the further stimuli of blind-end and electric grill to which latter negative responses are already attached. And these negative responses get conditioned back to the black curtain which just precedes them.

It appears that what our conditioned response friends really do is to divide all responses into two sorts—positive and negative. And they argue that in a trial-and-error situation the acts which get learned are those which result in bringing the animal into the presence of further stimuli to which positive responses are already attached. And the acts which do not get learned are those which result in bringing the animal into the presence of further stimuli to which negative responses are already attached. These resultant positive and negative responses get conditioned back to the cue stimuli. It must be noted, however, that the positive and negative responses which thus get conditioned back may in concrete terms be as different from the original responses from which they are supposed to be derived as entering is from eating or as not-entering is from jumping back and squealing. But this last is a little point which is not stressed by the theory.

Our conditioned response friends are truly both serpent-ish and dove-like.

But let us not be too captious. For it must be admitted that this conditioned response formula, even though it be thus a bit—shall we say—jesuitical, is really surprisingly workable. It can be applied usefully to most discrimination-box and maze problems [2] and, as such, it seems to provide a helpful schema for holding together past results and for predicting future ones. Nevertheless my purpose here must be to show that there are (or at any rate there ought to be) types of maze or discrimination-box finding for which this all-useful though emasculated conditioned response formula will not hold.

By way of a first example, let me return to an experiment of my own which used a discrimination-box like that just shown. After having, as part of another problem, over-trained rats in this discrimination-box, I tried putting them directly into the food-compartments and shocking them then and there. Then I carried them immediately around to S and started a run in the usual fashion. My assumption was that as a result of all their preceding training, in which they had been running through the box as the way to get to food, the rats would have built up what in my barbarous terminology I have called sign-gestalt-expectations.[3] These sign-gestalt-expectations I assumed would be to the effect that the earlier parts of the discrimination apparatus would have become a sign or a set of signs to the rats that the encountering of the food-compartments was to be achieved by running through this discrimination apparatus. And, if the rats had built up such sign-gestalt-expectations, I assumed further that a single experience of the changed character of the food-compartments (or, as I should put it, this changed character of the significates of their sign-gestalts) should have

[2] This elaboration of the conditioned reflex formula is probably to be credited in the first instance to Smith and Guthrie (14), to Wilson (18) and to Frank (2). See also Guthrie (4). Recently it has been further elaborated in a series of striking articles by Hull (7) (8) (9) (10) (11). Finally, for a criticism of it see Williams (17).

[3] For a further elaboration of this concept of the sign-gestalt-expectation, see Tolman (15), Chapters IX, X, XI and XXI.

been enough so that upon being reintroduced to the signs (that is, to the first parts of the discrimination-box) they would at once have inferred or remembered this new changed character in the goal-compartments. And hence they should have refused to run.

But alas, no such thing. Each rat (I must confess that I tried it with only four), after having been shocked in the food-compartment and then carried to the starting point, immediately dashed off gaily and just as usual through the whole discrimination-apparatus and bang whack into the very food-compartment in which he had just been shocked. If the rats had sign-gestalt-expectations, then sign-gestalt-expectations are not as intelligent as I have supposed them to be.

Furthermore, after some more days of the original training I tried a second procedure. I ran the rats through the discrimination-box first and gave them their shocks only then when they had reached the food-compartments at the termination of such a run. I then ran them a second trial. And on this second trial they all balked before finally getting to the food. In this second procedure the rats first ran the discrimination-box and received the shocks immediately after such runs. And this procedure worked. They all made the connection and refused to run on an immediately subsequent trial. In the former procedure, on the other hand, the rats were put into the food-box and shocked there first without any just preceding run; and it failed. They did not make the connection. (I may remark parenthetically that I tried both procedures several times with plenty of additional straight training in between and that I am convinced of the general validity of the results, at least for the special conditions of my experiment.)

But what is the significance of this difference in outcome? Obviously our conditioned response friends will immediately say: "Of course, in the case when the rats had just been run through the box before being shocked in the food-compartment the negative response to the shock had a chance, by virtue of the just preceding run, to get conditioned back to the various stimuli of the discrimination-box. But in the other

procedure in which the discrimination-box was not run through just prior to experiencing the shock in the food-compartment there was no such chance for the negative response to the shock thus to become conditioned back. Hence the difference in the two outcomes."

Discretion is, no doubt, the better part of valor. So I suppose I must admit that it does look as though the conditioned response people were here going to be justified. And yet I am not quite ready to be completely and finally downed. Thus, first of all as a very general alibi, I would point out that even though further work does continue to verify the above findings—even though it be indicated consistently and repeatedly that a change in goal-character can be carried back to the apparatus leading to that goal only if the stimuli of the apparatus have just preceded those of the new goal,—still this very fact is one which it took a sign-gestalt psychologist to discover. In other words, I would venture to assert that a dyed-in-the-wool, or I should say a drunk-from-saliva, conditioned responser would never have thought of even trying such an experiment. The sign-gestalt hypothesis has to that extent justified itself. It has initiated an interesting and illuminating experiment which was necessary to prove its own downfall.

But anyway I still have in addition a couple of more specific alibis. The foremost of these would be to assert that the negativity of my results (that is, their negativity from my own sign-gestalt point of view) may possibly have been due to one particular feature of my special set-up. For it must be noted that I tried this experiment only after my rats had had a very great deal of over-training. And this may have meant that they had become what Gilhousen would call 'fixated'[4] before the experiment began. That is, if the change in the character of the goal had been made earlier, the rats might still have been able to respond to it in true sign-

[4] For the original discussion of this concept of 'fixation' see Gilhousen (3) and for a subsequent further experimental investigation of it see Krechevsky and Honzik (13). Finally, for still other investigations of what seems to be essentially the same phenomena but which has been called by them 'Behavior Constancy' see Hamilton and Ellis (1) (5) (6).

gestalt fashion. And the fact that under the conditions of the experiment, as I carried it out, they did not make this sign-gestalt adjustment may mean merely that at the time of the experiment they had sunk to the level of something much more automatic and 'fixated'—something, if you will, like a true conditioned response. And we would then conclude that whereas under such overtrained conditions learning would follow conditioned response principles, at earlier stages in the learning curve it would follow sign-gestalt principles.

Finally, my last alibi lies in the results of another somewhat different set of experiments already on record. These are the experiments of Hsiao (**12**) and of Honzik and myself (**16**) with what we called the 'insight' maze. We found that under certain conditions a rat will avoid a given alley-entrance not only when he has experienced that this alley-entrance itself is followed by a negative-evoking stimulus (in this case a block) but also when he has experienced this negative stimulus (block) merely as the result of another alley-entrance which debouches into the former one.

Figure 2 shows the ground plan of the elevated maze which was used by Honzik and myself. It will be observed that Path 2 debouches into Path 1 and that Block *N* makes Path 2, as well as Path 1, useless. In the preliminary training the rats were forced down all three paths in an irregular order by putting blocks near the entrances of any two of the three paths at such points as *x*, *y*, and *z* and they soon learned, as the result of this preliminary training, first to try Path 1 and then, if this was blocked at *x*, to try Path 2 and only then, if this also was blocked at *y*, to try Path 3. But, finally, in the test trial (and it is only this test trial which will interest us here) the block was inserted at *N* which, as has been noted, is in the common segment of Paths 1 and 2. In this test trial the rats as before entered Path 1 first but they found themselves blocked at *N* and hence retraced. Then, however, instead of next trying Path 2, as they had practically always done before, they now immediately chose Path 3. In other words, it appears that the negative-evoking character of *N* was carried back not only to the stimuli at the entrance to

Path 1, which stimuli had actually just preceded it, but also to the stimuli at the entrance to Path 2, which stimuli had never thus preceded *N*.

Here, evidently, the conditioned response formula will not and does not suffice. To explain *these* results some other

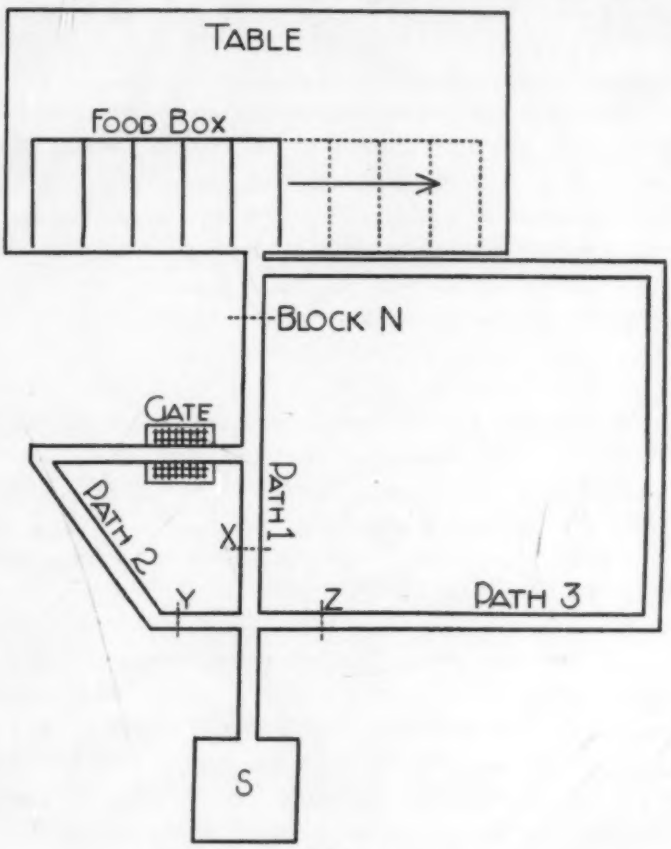

FIG. 2.

formula must be found. And I suggest something like my sign-gestalt formula as the proper substitute. The rat because of all his preliminary training is ready after he has found the block at *N* to cognize that he will in all probability meet this same block *N* if he now enters Path 2. For he has built up sign-gestalt-expectations in the sense that the

entrance to Path 1 has become for him a sign for the coming of the common segment and that the entrance to Path 2 has also become a sign for the coming of this same common segment. So, now, when he discovers the negative character, *N*, in this segment as a result of entering it from Path 1, he necessarily infers this same negative character to be met as a result of entering it from Path 2.

So much by way of alibis. Let me sum up.

(1) A change from positive to negative goal-character if met by the rat just after an actual run affects his behavior on the next trial. This finding can be explained by the conditioned response formula, or at any rate by that jesuitical form of it which passes current among psychologists in this country.

(2) A change in goal-character (or rather in this case in the character of a part of the maze just proximate to the goal) which a rat meets at the end of one path will carry back to a second path which the rat has already learned as debouching into the first. This finding cannot however be explained by the conditioned response formula. It suggest something more like the sign-gestalt formula.

(3) Finally, a change from positive to negative goal-character which the rat experiences quite *de novo*, without that is having just run over the path which leads to the goal (although he has previously frequently been over this path as the way to get to the goal) does not affect his behavior on the next trial. At least it did not under the special conditions of the experiment as I carried it out. This negative finding forces us to conclude either that the conditioned response doctrinaires are to some extent correct after all, or else that my animals, because of overtraining, were unduly 'fixated.' If this latter were the case, we might conclude that the sign-gestalt formula is appropriate only for the earlier stages of learning, and not for the later ones.

But obviously many more experiments are needed. Some of these I hope to carry out myself in the near future.

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PROCESS–PSYCHOLOGY, INDIVIDUAL AND GENERAL

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At the present time, psychology is most frequently declared to be concerned with the study of behaviour. As with other branches of science, this general indication of the field to be examined is left comparatively undefined, until the particular method of investigation is set forth; for it is the latter that gives to the field its specific limits. Hence we find no definitions of the concept 'behaviour' in our literature, save those which derive from methodological postulates; or, stated another way, we find as many definitions of 'behaviour' as there are systematic approaches to its investigation.

This matter of definitive limits of the field to be examined is very important. A little reflection shows that much of our so-called controversy is unjustified. The number of approaches to the study of behaviour is very large indeed; and many of these are so distinctive that they give to the term 'behaviour' quite unique meanings;—as, for example, those concerned with phenomena that can be respectively brought under the stimulus-response, subject-object, organism-environment formulæ. So distinctive are such fields, that critical comparison of the systems deriving from them is impossible, save in terms of the basic criteria of scientific method generally (1);—a fact that, in these days of unfortunate partisanship, we should do well to realize.

A particular system, however, may be evaluated from two main standpoints. In the first place, having reduced the method to its lowest terms,—when, as Bott has shown (1), an unquestioned dichotomy is revealed, which typifies the phenomena to be investigated,—we may examine the consistency with which this method is followed. We may ask, for example, if Watson is justified, as an advocate of the

stimulus-response approach, in speaking of 'adjustment,' of 'integration.' As a practical psychologist, he may, of course, make use of various systems in interpreting phenomena; but as a Behaviourist, he is committed to a particular field.[1] Secondly, we may attempt to discover how far the approach in question meets the demands of a practical purpose. In certain problems of educational guidance, for instance, the relations between various efficiencies may be legitimate objects of enquiry. Are not these, however, precluded from the field of search adopted by Behaviourism? Are not our wranglings as to whether 'intelligence' as conceived by Watson can be harmoniously related to Spearman's *g* or to any like conception, unwarranted in the light of the real nature of the systematic psychologies in question? For the educational purpose instanced here, to attempt to invoke behaviouristic aid would appear to be illogical, to say the least.

Of these two standpoints of evaluation,—consistency and comprehensiveness,—the second is most pertinent to our present theme. As indicated above, comprehensiveness has reference to a previously determined purpose behind the investigation.[2] From this, two significant corollaries follow. The first stresses once more the fact that the limits of any scientific approach are set by the approach itself. They do not—save in any definite setting—pertain to science as such. It is sometimes erroneously supposed that the method of science (conceived in abstraction) is itself limited, so that certain realms of knowledge are not open to scientific search. Our contention here is that the only limits of this kind that

[1] According to the above contention, eclecticism is methodologically impossible in pure science. For similar reasons, two fields of science may not 'overlap,'—a fact that we should recognise when attempting to differentiate between psychology and physiology, for example.

[2] For this reason, an understanding of the purpose behind any particular scientific approach is essential to an appreciation of its nature. Thus the mediæval discussions of the soul's activity, post-renaissance emphasis on experiential content, and the like, all mirror the prevailing social philosophy underlying investigations into human behaviour. Consequently a thorough acquaintance with educational theory—in which social philosophy finds its most concrete expression—is extremely helpful in interpreting the history of psychology.

the scientist can agree to, are those that indicate the youthfulness of science as now practised. As approaches are originated that include these unexplored realms of knowledge within their fields, so will the domains of scientific enquiry extend. Scientific method as actually employed, is able to bring results only by virtue of its limiting the field to be explored; but the fields possible to science would seem to be unlimited, all-inclusive,—at least in so far as rationalism applies to the realm of phenomena.

The second corollary that follows from the fact that comprehensiveness refers to the underlying purpose of the study, is that science is more than natural science.[3] While this deduction is obviously included in the first, it is worthy of special mention because of its tacit denial by some modern authors. Since the days of Descartes there has been a growing tendency to consider immediate succession as the only time-element to be included in scientific causality. There is no reason, however, why we should not give place also to temporal relationships of a different order, provided that our practical purposes so demand. Now, that demand is most certainly felt in dealing with many of the problems of human development, especially when an experiential approach is undertaken. Consequently teleological concepts, concepts of organization, of adjustment, are frequently essential; and our task is one of devising scientific methods for determining the concepts to be used, the phenomena to be investigated.[4]

Instead, therefore, of limiting the concept 'behaviour' to overt response, to stimulus-response units mechanically conceived, to mere motion of an organism (in whole or in part), let us set out to examine human activity in such a way that we give place to organization, adjustment, purposive behaviour. This we must do if we are to include much that is

[3] The term 'natural science' suffers from equivocality, and, to some extent, from misuse. It is employed here in a methodological sense, to signify the mechanistic approach adopted by physical science.

[4] The above statement appears to harmonize with the thought of many present-day schools of genetic psychology. When the genetic interest is expressed in phenomenological approaches, the contention of Ward (7)—that modern experiential psychology happily combines pre-Cartesian objectivity with post-Cartesian subjectivity—is especially true.

of direct significance in human development, especially when viewed from the standpoint of experience. Let us tentatively look upon behaviour as *movement organized by process*. By this we mean to imply that behaviour is more than movement. It is organized in the sense that it has an end or purpose, which is far more pertinent to our practical interests, and significant to the act itself, than are the particularities of movement; and the principle of organization is here designated *process*. Process involves experience, is self-directed (motivated, inherently purposive), and modifies the motion in that it constitutes the organization of the motion. It is not something superimposed from without; is not to be conceived in terms of dualism. It *is* the total organization-in-action. Not a mere pattern of movement, seen by relating the various part-activities after they have taken place; not an abstraction cognised by the observer; it is the dynamic which permeates behaviour and constitutes it. The part-activities are meaningless in themselves or in mere conjunction or series. They are the unimportant elements of the behaviour, and are non-essential in that they are usually not the only possible specifics. As James would say, they are the *means*, and consequently may vary from time to time even though the same end is accomplished. Fixed as they may be under any given set of conditions, we are interested in the total behaviour act, regarded as not so circumscribed. Reflex acts as such come within the scope of behaviour only in so far as they may be included in such motion-organization; so, too, with instincts, or chains and patterns of reflexes. As fixed, invariable forms of motion, they are not behaviour; but process will include them in behaviour. Themselves, they can never explain behaviour;—'the whole is more than the sum of its parts.' Likewise we can conceive of an organism which executes invariable patterns of movements, or reacts mechanically to stimuli by means of such patterns. But these would not be psychological phenomena in the present sense, although the data obtained from studying them would be of value to the psychologist. They become psychological phenomena when the character of invariability is changed to modifiability,—

and modifiability which is not merely of the type instanced by 'retentivity,' or illustrated by the synaptic hypothesis, where change is assumed to arise by virtue of motion; or which is merely a varied form of reaction to new stimuli; but a reorganization of motion by virtue of the dynamic properties of the behaviour itself. 'Modification in the light of cognised experience' is perhaps the nearest approach to definition of this latter aspect that we can achieve, although the fuller interpretation of such a phrase must be reserved until later.

Expressed another way, behaviour is here viewed in terms of the relationship between condition A, immediately prior to the behaviour, and condition B, the end result; and that relationship is given the dynamic name 'process.' Condition A does not *cause* condition B,[5] but *becomes* condition B; there is not only change, motion, but organized motion. This mode of indicating the field to be examined is analogous to that which regards behaviourism as being concerned with the relationship between stimulus and response, and calls the relationship 'reaction.' There is no question as to the one being right, the other wrong; both are legitimate fields of study. For certain practical purposes, however, concerned with the problems of human development, the process approach seems to be important.

Our task is now to indicate how this field of behaviour may be examined comprehensively. Particularly must we exercise care in avoiding any form of analysis that would destroy the unity of the behaviour act. At the outset, therefore, we appear to be limited in our considerations to two universal and necessary attributes of behaviour—time and direction. Starting with process, thus analysed, we are able to examine its nature experimentally and strictly objectively; for direction and time may be controlled independently of each other. Thus we may give one subject many tasks to perform (in this way instituting directional control), and measure the time taken to do each task. Similarly with another subject.

[5] Unless the non-mechanistic (and more directly experienced) view of cause be here understood.

The relation between the times taken by the first and those taken by the second, may lead to some striking facts concerning the time variable as manifested in behaviour.

This form of analysis, undertaken for purposes of control, in no way destroys the unity or wholeness of process. It seems to offer a way out of the difficulty emphasized by those who maintain that mental measurement is impossible at the present stage of knowledge concerning behaviour (**3**).

In a similar manner, further measures of relation may be obtained. Controlling direction, we may determine the variations in speed due to directional changes, to prolonged, continuous activity, to many repetitions of the same task, to the simultaneous performance of another task. We may examine the time during which a particular direction is adopted when alternative directions are possible. Controlling time, or evaluating the results irrespective of time, we may examine the directions adopted by an individual in his behaviour. The possibilities seem to be very great indeed, as these few examples will show.

Before proceeding further, it is well to note that the techniques of 'individual differences' are obviously involved in such a programme as has been indicated above. Especially significant are the techniques of Spearman (**6**), by means of which it is now possible to avoid the fallacies of earlier work in the field of measurement. Of these, the one offering most hindrance to progress was the assumption that the concepts of general psychology were indicative of measurable entities.[6] Even when Binet's outstanding contribution ensured the prestige and permanent worth of mental testing, the same assumption led to much useless controversy concerning the interpretation of test results. Happily the reverse procedure —that of establishing first an objective validity of tests, thence proceeding experimentally to determine the functional nature of the discovered entities—ensures a working harmony between individual and general psychology.

Returning to the above analysis, it is clear that many of the experimental results already available can be interpreted

[6] Measurement in Education has suffered from an analogous fallacy.

in this setting. So far, however, the only purely temporal factor that has been isolated is *g*, which functionally corresponds to speed of cognition (6). The experimental analysis of this functional counterpart, giving us Spearman's formulation of the Noëgenetic Processes, is consequently all the more basic and significant in directing our further studies of behaviour. A few of the lines of investigation that have been established are discussed in what follows.

The doctrine of Noëgenesis now makes possible the more definite description of direction. Instead of indicating the directional aspects of a behaviour act in gross terms, such as those pertaining to the end or goal, or to the urge, drive, instinct or motive, we may allow for variations in behaviour that are hidden beneath these broader concepts. The same end may frequently be achieved, the same motive satisfied, by various lines of behaviour. Description of an act in process terms, being more specific, allows for these variations. Hence many aspects of learning that would otherwise be overlooked are seen in bold relief.

In illustration of this, we may cite recent work on the function of repetition. It has now been demonstrated (5) that when the act remains exactly the same on subsequent repetitions, the time taken to perform the act is constant. Logically, this is, of course, what one would expect. But traditional interpretations of 'facilitation' have denied this constancy. Repetition has, heretofore, referred to the end achieved, rather than to the process of achievement. Variations in the latter have been observed, it is true, so that repetition-of-process has not been assumed,—until attempts have been made to explain improvement-through-practice. By ensuring repetition of process, we now find no evidence for facilitation in the old sense; and improvement is being reinterpreted, with the emphasis upon 'achievement.' Furthermore, this demonstrated constancy of process-speed offers very valuable experimental possibilities, since changes in the time taken to perform what appears to be the same act really indicate process-changes.

The above reinterpretation of some of the basic concepts

of learning [7] is very obviously implied in many tendencies manifested by genetic psychology. The process approach, fostered especially by the modern interest in child development, calls into question similarly the gross assumptions that are cloaked beneath mystical concepts such as 'maturation,' 'growth,' and so on. 'Mental Age' must likewise be critically examined; for while the implied generality and unity of function have been justified by Spearman's factor-analysis, the mystery of the growth of *g* has not received much attention. The phenomenological character of the process approach at once makes it obvious that none of our evidence really justifies the conclusion represented by the usual growth curve. Binet's method could never give legitimate evidence on the question, since he assumed growth at the outset. Time measures, however, suggest the lines along which we might determine any variation in *g* with age, if directional control can ensure constancy of process.

The experimental investigation of directional aspects of behaviour offers more difficulty than is the case with temporal aspects. Directional relations, however, may now be determined by means of the group-factor technique. If, as seems to be the case, the *s* factors indicate the degree of organization already achieved, they will be specific only in so far as they pertain to directionally-specific behaviour acts. Directionally-similar acts will accordingly give rise to the phenomenon of 'overlap.'

This view is substantiated by careful examination of the cases where overlap occurs. It is likewise in harmony with the interpretation of 'habit'—implied in the foregoing—as directional organization, rather than as facilitation; and with the conception of memory, not as involving the store-house or other structural notions, but as dynamic redirection of behaviour in a manner similar to that which obtained on a previous occasion. Its value to experimentalists, however, is just as limited as are views involving other techniques, without the additional and essential aid of a systematic plan

[7] It is now quite clear that 'learning' and 'psychology' as here used, are identical fields of science.

of investigation. Our remaining task is to indicate some of the necessary features of such a plan.

Let us state our problem another way, in order that we may be more clear as to its nature. We have contended that speed of cognition is a basic individual difference; that this speed shows itself to be a general characteristic of an individual's behaviour; that measures of the time taken to perform carefully directed behaviour acts (such as those included in 'intelligence' tests) show this characteristic as a functional unity; that there is, as yet, no evidence for the conclusion that this basic time-factor 'grows'; and that the functional interpretation of this general individual difference is adequately expressed in the doctrine of Noëgenesis. Direction as such does not lend itself to measures of individual differences, since, if two people perform the same act, their behaviour may manifest temporal differences, but not those of direction. Nevertheless, the efficiencies of behaviour acts, dependent as they are upon acquired organizations of behaviour, may be so evaluated in terms of time-measures, as to show interesting groupings. These 'group-factors,' therefore, may be examined in terms of the directional relations which they indicate.

How may these group factors be explored? So far, a piece-meal procedure has been adopted. Group factors have been stumbled upon accidentally. Thus we know that arithmetical tasks, mechanical operations, and so on, manifest directional relations that can be built up by training. The arbitrary nature of these divisions—arithmetic, mechanics, etc.—indicates at once the fact that they do not conform to any psychological plan of investigation; so that we should regard them as illustrations of the group-factor method, rather than as important aspects of a comprehensive psychological system. We still need a plan of investigation based upon psychological principles, and offering a comprehensive survey of directional relationships.

Attempts to do this have usually resulted in structural, rather than functional, descriptions. This is inevitable when differences between directional aspects of behaviour are

stated in 'content' terms. 'Arithmetic,' 'mechanics,' are good examples of this. 'Instincts,' and similar concepts, are structural counterparts of content-classes of behaviour such as 'food-getting,' 'sex,' and the like. Classifications in terms of 'values' are similarly non-psychological in any dynamic sense, and therefore lead to arbitrary subdivisions of the field of direction, in such a way that there seems to be no necessary relationship between one group of directions and another. Faculty psychology was structural in the same sense, although it preserved a functional approach within the confines of each faculty.

There is one attempt on record that suffers from none of these defects; and yet the results are not as significant to our present purpose as is desirable. Spearman demonstrated that when such arbitrary, non-psychological classifications of mental functions as the faculties are interpreted in terms of process, the subdivisions disappear. All forms of behaviour manifest their dependence upon the Noëgenetic principles. He therefore proceeded to investigate the whole field of relations, to see whether any comprehensive grouping of relationships into logical classes corresponded with measurable group-factors (**6**). In the main, no such clear-cut correspondence was found; but the indications of correspondence were suggestive enough to offer a lead to us here. We may, accordingly, take his results in regard to 'objective relations,' for example, and endeavour to show the possibilities they indicate in our present setting.

Spearman has shown that whereas such classes of relations as 'likeness,' 'identity,' do not mark off regions of cognition which manifest broad group-factors, the reverse is the case when the behaviour evaluated depends critically upon the clear appreciation of relations of objectivity. By the latter he means the apprehension (by analogy with one's own experience) of the subject-object relationship. Now such a broad grouping of behaviour is definitely psychological in nature, and marks off a division of the directional attribute that is of great significance in social adjustment. Moreover, it involves an organization of cognition in a direction that is

demanded by, and trained in, social intercourse; and the possibility of applying the techniques of measurement to its evaluation, and thus linking it with experimentally controlled training procedures, has far reaching importance. The writer has evidence,[8] for instance, that suggests definitely that the apparent rise in I.Q. manifested by some pre-school groups of children can be traced, not to an increase in *g*, but to a more rapid development of this 'objectivity' group-factor under nursery school conditions,—where the objective relationship is of greater significance for adjustment than in less socialized situations. Whether the main source of 'coaching' in regard to good tests of *g* lies in a similar refinement of the child's interpretation of the 'meaning' of the examiner's questions, is an analogous problem to which attention is now being directed.

Similar interpretation seems to underlie the appearance of linguistic, logical, alertness, and other group-factors. In each case an environmental demand can be paralleled with the developing directional grouping of behaviour. To the linguistic demands of ordinary society, which involve a level of subtlety that is reached in the early high-school years, the so-called maximal point of *g* development may be due; for certainly the process-homogeneity of the usual intelligence tests is greater for ages above fourteen, than is the case with ages ranging from fourteen downwards. The appearance and 'growth' of *p* ('perseveration' or 'inertia') seems to be similarly a directional development that is concerned with the basic habits of choice, and the individual's training in consistent acceptance of the consequences of his decisions. When measures of such factors are more reliable, their functional validity may well be established in such a way that the factors themselves indicate the efficacy and nature of training procedures operating in the home or at school.

These considerations seem to suggest some features that are essential to any comprehensive plan of investigating directional relations. The cognitive processes themselves, necessary to the performance of given tasks, are not significant

[8] Shortly to be published.

indicators of directional organizations because of their generality. But the known purposes of the acts involving these processes seem to become systematized in connection with the subject-object relationship. Spearman's first law emphasizes the complexity of known experience, in that we not only know, but know that we know. The knowing processes (passive) are known in relation to a purpose, which is active.[9] Interesting manifestations of this distinction are frequently met in studying mental hospital patients. With free-association tests, for example, one may obtain many responses that show a normal reaction time, and a typical answer; yet periodically the time of response lengthens considerably, even though the usual word-answer is given eventually, and the particular stimulus-word seems not to be directly connected with the phenomenon. Here it appears that some confusion of purpose, some 'cutting across' the examiner's directional control, is actively interfering with the task on hand.

While such experimental demonstrations as the foregoing are illustrative and suggestive, however, we are more particularly concerned with the systematization of our observations of the active purposes that are manifest in human behaviour; and these, in a process psychology, will be discussed in process terms. Consequently, the fundaments between which directional relations mediate, must be those that are universal in experience, since otherwise we are forced to use classifications that pertain to content viewed in other than dynamic, psychological terms. Hence these fundaments will include the ever-present self and its object-counterpart.

From this standpoint it is quite justifiable to regard the prime motive in human behaviour to be that of withdrawal from unpleasure. Using Ward's classical distinction between sensory qualities and feeling—namely, that feeling is apprehended as pertaining to the subject, while sensation inheres in the object—activity arises in unpleasure, quiescence in pleasure. Behaviour resulting from initial unpleasure gives rise to experience, and utilises the mechanisms available to

[9] Menon (5) appears to substantiate the above when he says that eduction is effortless. Reproduction is effortful in that it involves the active redirection of the cognition (in a manner previously adopted).

the individual by virtue of his organic nature. As the pleasure-outcome of the activity is known in relation to the activity itself, the possibility of dynamic intention is developed through active acquiescence.

The directional poles thus experienced are but the subject and the object. By virtue of cognised experience, with its distinctions between self, not-self, other-self, other-object, and so on, the more complex motives (or intentions, directional trends), manifest the following pairs of attributive opposites. They may be egocentric, or allocentric. If allocentric, they may be directed towards the subject-ive experience of a personal object (in which case we might call them 'sympathetic'); or, they may be directed towards the object of the personal object (and hence may be termed 'co-operative'); or, lastly, they may be simply and impersonally 'objective' (4, 2). We therefore have the opposites, sympathetic, non-sympathetic; co-operative, non-co-operative; objective, egocentric. Each class of intention may be active or passive, stable or unstable. If we add these to the previously-mentioned opposites, we seem to have a scheme of directional trends that is simple, yet comprehensive. How could it lead to experimentation?

In the first place, it would avoid the perpetuation of the fallacy of attempting to measure structural aspects as if they were functional unities. This we have already decried as a legacy of early conceptions of testing, where the existing concepts of general psychology were taken as indicative of measurable entities. Under the present scheme, where measurement concerns itself with dynamics, psychological terms such as 'emotion,' 'perception,' and the like, become meaningful dynamically in terms of Noëgenetic processes, directed in accordance with purposes that can be classified as above. In this way much of the observation prevalent in child laboratories would contribute to a fuller understanding of process, but would avoid some of the statistical errors now committed. Incidents would be classified according to the directional characteristics, and interpreted phenomenologically, rather than as mere events.

In the second place, the experimentation which led to the above suggestion, itself constitutes a positive answer to our question. Further research will indicate the feasibility of differentiating between objectivity group-factors of the co-operative type and those akin to what we have called sympathy. Statistical factors, manifesting themselves in various groupings of behaviour situations, may be used as the indicators of individual differences which, when evaluated for any one individual, will give a pattern of relationships; and the significance of such a pattern will possibly be interpretable by means of the trends here under discussion.

Summary

At the outset it was contended that, since the limits of any field of science are determined by the method of investigation, the term 'behaviour' may have various connotations. The particular method chosen, and therefore the interpretation given to 'behaviour,' depends upon the purpose of the study. Accordingly there is scientific justification for viewing human activity in terms of organization and purposiveness, since practical interests in children's development demand such an approach. Behaviour thus defined has two essential characteristics, time and direction. By calling upon the techniques of individual differences, these characteristics may be so examined as to lead to a knowledge of basic mental processes. Especially important are the Noëgenetic processes, which are revealed and identified through measurements of the time variable. Directional relations in behaviour are more difficult to examine; but the group-factor technique offers great possibilities. The necessary plan of investigation in which this technique would assist in surveying the major groupings of directional characteristics in human behaviour, has never yet been adequately formulated. But from some recent results we are able to see some of the lines along which such a survey would run.

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GOAL-OBJECTS, PURPOSES, AND BEHAVIOR

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Those who a few years ago waged a war upon the concept of instincts seem to have settled back convinced that the concept had been rather thoroughly evicted from the field of psychology. But surely the disguise under which it has found its way back into the fold has deceived no one. The concept of drives, incentives, urges, cravings, desires, motives, purposes is surely none other than our old friend under a new name, with possibly one genuine change. Drives are not conceived as being so intimately bound up with inheritance as were instincts. Because of this change the concept of drives may not encounter the same intense disfavor accorded the instinct doctrine, but the fundamental division between those who defended and those who attacked the concept of instincts was based upon opposing views as to whether it is necessary to assume special motivating forces or factors in describing and explaining animal behavior. Those who defended the instinct doctrine and who now employ the concept of motives are convinced that a stimulus-response description and interpretation of behavior is inadequate, that behavior is adequately described and explained only when it is referred to drives, motives, urges, cravings, wishes, desires, purposes,[1] only when it is described as means to ends, as goal-seeking activity, as attempts to attain definite purposes. Tolman, for example, contends that "behavior always seems to have the character of getting-to or getting-from a specific goal-

[1] These terms are practically synonymous, but because of the nature of the English language, it is sometimes more convenient to use one rather than another. The term incentive also is sometimes used as a synonym for these other terms, but it is also used to designate the goal-object and to designate the kind of behavior displayed. For example, it is said that the rat's incentive in running a maze is satisfaction of hunger (motive) or food (goal-object) or food-getting (behavior). This manifold usage of the term incentive makes the term practically useless.

object, or goal-situation," that "the complete identification of any behavior-act requires a reference first to some particular goal-object or objects." The purpose of this paper is not to discuss the correctness or incorrectness of this contention but is rather to examine the nature of goal-objects and of the behavior which leads to or from them.

Certainly it is true that an investigator, in inducing an animal to work on a given problem, employs goal-objects: he motivates the animal by using goal-objects. The goal-objects are of two sorts: (1) those which the behavior is getting-from, *e.g.* an electric grill, a tank of water, confinement, and (2) those which the behavior is getting-to, *e.g.* food, drinking water, the litter, companions, the opposite sex, the nest. Goal-objects of the first type excite the animal's sense organs before the getting-from behavior is displayed and are so similar to simple stimuli that we shall not pause to discuss them. Those of the second type do not, however, excite the animal's sense organs until after the getting-to behavior is exhibited. They seem to influence behavior when they are not immediately present and so seem to be distinctly different from simple stimuli. The questions which arise are the question of the extent to which they do influence behavior in their absence and the question of the manner in which this influence is exerted. The basis for the answers to these questions will perhaps best be laid by comparing goal-objects and simple stimuli.

The Nature of Goal-Objects

It may first be noted that when a goal-object of the second type is immediately present it serves as a simple stimulus. Food acts as a simple stimulus for eating, water as a simple stimulus for drinking, the opposite sex as a simple stimulus for mating, the young as a simple stimulus for giving suckle. It is to be assumed that these objects, like any stimulus, are dependent for their effectiveness upon the neural organization of the animal. But unlike many stimuli, goal-objects are also dependent for their effectiveness upon special internal conditions or states. Food is not effective for causing

eating unless the animal is hungry, water is not effective for causing drinking unless the animal is thirsty, the opposite sex is not effective for causing copulation unless sex tensions are present, the young are not effective for causing the female to suckle them unless the female is lactating. Here, then, is a first difference between a stimulus and a goal-object. The latter is dependent for its effectiveness upon a particular internal condition or state, while a simple stimulus has no such dependence.

A second difference arises from the fact that the direct response (the one made when the goal-object is immediately present) removes the internal condition upon which the goal-object is dependent for its effectiveness. Eating removes hunger, drinking removes thirst, copulation removes sex tensions, giving suckle removes tenseness of the udder. Since the internal condition is eliminated by the direct reaction, the goal-object loses its effectiveness for some time after reaction has been made to it. After food has been eaten, it loses its effectiveness for causing reaction, and this loss of effectiveness continues until hunger returns. In the case of simple stimuli and in the case of goal-objects of the first type there is no comparable loss of effectiveness after reaction has been made, although there is a loss during the very short refractory period and in some instances also after frequent repetition of the stimulus at short intervals. More characteristically in the case of simple stimuli there is a gain in effectiveness after reaction, there is a summation effect. Reaction to simple stimuli causes no loss and in some cases a gain of effectiveness, while reaction to goal-objects causes a marked and extended loss.

A third difference is more a matter of degree than of kind. Goal-objects have very high stimulating value: the direct responses to them are vigorous and physiologically dominant. As a result the responses to goal-objects are highly subject to conditioning. A secondary stimulus may become a substitute for a goal-object more readily than for another stimulus. If an animal is regularly fed in a given box, that box tends to set off eating reactions in the hungry animal; if he is regularly

fed at a given hour, the approach of that hour tends to set off eating reactions; if he is regularly fed after the sounding of a gong or after being lifted from his cage, the sounding of the gong or his being lifted from his cage tends to set off eating reactions. In like manner the reactions to other goal-objects are easily conditioned.

More important than this conditioning of the direct or skeletal response in the conditioning of the internal or visceral reaction. The act of eating is followed by the flow of digestive juices and the peristaltic action of the stomach. Any stimulation which regularly precedes eating tends to become effective for producing these internal activities, and these internal activities, if they occur when no food is in the digestive tract, are the internal condition upon which food is dependent for its effectiveness, are hunger. The act of mating is accompanied by increased activity in the reproductive organs. Any stimulation which precedes mating tends to increase activity in these organs, to produce the sex tensions upon which the opposite sex is dependent for its stimulating value. Giving suckle is accompanied by increased speed of milk generation. Any stimulus which precedes suckling tends to produce a rapid lactation, to give rise to a tensed udder. Both the visceral and the skeletal components of the response to goal-objects are highly subject to conditioning.

If on the basis of this comparison a definition of a goal-object were attempted, it would be somewhat as follows: a goal-object of the second type is one which is dependent upon a special internal condition for its effectiveness as a stimulus, which, when directly reacted to, loses its effectiveness, and which evokes a vigorous and dominant response with both skeletal and visceral components both of which are highly subject to conditioning.

Goal objects of the first type have none of these characteristics, unless it be that of high stimulating value. This relatively high stimulating value seems to be the only excuse for setting them apart from simple stimuli. A strong or a persisting electric shock differs from a flash of light or a noise only in the certainty that it will cause a response and in the

vigor of the response evoked. If the first response to the shock is blocked in some manner, the stimulus has such high stimulating value that it will induce other responses. Thus these stimuli of high value will induce "trial-and-error" behavior, while simple stimuli of less value will not evoke such activity. If, then, we were to attempt a definition of a goal-object of the first type it would be as follows: a goal object of the first type is a simple stimulus whose stimulating value is sufficiently high that it will under proper conditions evoke 'trial-and-error' behavior.

Influence of Goal-Objects upon Behavior

The readiness with which the responses to goal objects of the second type are conditioned to substitute stimuli and the presence of internal states upon which these goal-objects are dependent for their effectiveness make the goal-object *seem* to be effective in its absence. The internal state—hunger, thirst, sex tension, tenseness of the udder—acts as a stimulus to generally heightened activity,[2] and increases sensitivity to immediate stimulation.[3] This internal state persists until the goal-object is reacted to, and consequently the heightened activity also persists. The observer who knows what internal conditions is giving rise to the heightened activity can state what goal-object must be reached before the general activity ceases, and consequently he tends to refer the heightened activity to the goal-object rather than to the internal condition. He also has additional reason for

[2] Richter and Wada report investigations showing the relation between general activity and contractions of the stomach in the rat. (C. P. Richter, Behavioristic study of the activity of the rat, *Comp. Psychol. Monog.*, 1922, 1, No. 2, and Animal behavior and internal drives, *Quart. Rev. Biol.*, 1927, 2, 307–343. T. Wada, An experimental study of hunger in its relation to activity, *Arch. Psychol.*, 1922, 8, No. 57.) Wang has shown the effect of œstrous cycle upon activity. (G. H. Wang, The relation between 'spontaneous' activity and œstrous cycle in the white rat, *Comp. Psychol. Monog.*, 1923, 2, No. 6.) The group working under the direction of Professor Weiss noted the relation between activity of infants under ten days of age and hunger, fullness of bowels, and fullness of bladder. There are numerous other studies showing similar relations.

[3] This increase of sensitivity with heightened activity of the organism has been repeatedly demonstrated for the lower animals by Child and others. It seems safe to assume that it holds also for the higher animals.

referring the activity to the goal-object, for the activity displayed in getting to one goal-object may differ from the activity displayed in getting to another. The heightened activity is apparently not merely random activity that happens to bring the animal to the goal-object: it seems rather to be directed heightened activity, to be directed endeavor. This directional character results from two things which accompany the internal condition.

In the first place the same substitute stimuli which evokes the internal condition giving rise to the heightened activity tend also to evoke the direct skeletal act. The situation in which an animal is regularly fed tends not only to produce hunger but also to set off eating reactions, to give rise to a neural or a neuro-motor set or readiness for eating, to make the animal ready to respond to some stimuli and ignore others.[4] The presence of this neuro-muscular readiness gives to the behavior its selective or directional character. The hungry animal's behavior is not merely random activity: it is food-seeking activity because the animal is neuro-muscularly ready to respond to food and is less ready than usual to respond to other stimuli, and this is true even though the situation is new to him.

As the animal has more and more experience in going from a given position to food, the trial-and-error character of his behavior drops out: his activity becomes more and more directed toward food. He learns to ignore some of the elements of the situation, elements to which he responded when the situation was new, and he learns to respond more readily to other elements of the situation, elements to which he reluctantly responded when the situation was new to him. When the situation was new, the animal was driven to react to first one element and then another. In reacting to some elements, the animal encounters blockage or pain stimulation,

[4] That an activity in progress makes an organism more sensitive to stimuli which arouse that activity and less sensitive to other stimuli is easily demonstrated in the lower animals. The region stimulated becomes highly active and dominates or controls other regions, *i.e.* the response to a stimulus is in part the creation of a temporary gradient pattern, and the presence of that gradient pattern alters sensitivity throughout the organism.

and thereby becomes conditioned to avoid or ignore these elements. In reacting to other elements, no blockage or noxious stimulation is encountered. The total situation and his hunger precede his responses to these non-blocking and non-noxious elements, and the situation and the hunger come through conditioning to evoke responses to these elements.[5] This learning to respond readily to those elements of the situation which in the past have been responded to in the course of going to food, Tolman calls a *means-readiness.*

From this analysis it is to be concluded that three factors influence the animal's getting-to behavior. First there is the internal condition which acts as a stimulation to general and theoretically random activity. But linked up with this internal condition there is a neuro-muscular readiness for response to the goal-object, and this readiness gives the general activity a selective or directional character even in new situations. Finally, as the animal gains experience in getting from a given situation to the goal-object, there is a conditioned avoidance of some elements and a conditioned readiness of response to others,—there is, if you please, a selective means-readiness. This means-readiness gives the activity a thoroughly directed character. These three factors are operative for any internal condition and for any goal-object. In the case of sex tensions, there is a substitutively aroused readiness for mating, in the case of thirst a substitutively aroused readiness for drinking. These three factors, the internal condition, the readiness for direct response, and the means-readiness all precede the getting-to behavior and may properly be conceived as its causes. There seems to be no reason to hold that the non-present goal-objects influence the getting-to behavior, except as they have served as unconditioned stimuli in the process of building up these conditioned readinesses.

[5] The author is, of course, aware that many theories have been put forward to account for learning from trial-and-error and that this simple statement of the conditioning theory originally proposed by Smith and Guthrie will meet with objection. He is, however, unable to see any fundamental inadequacy of the theory. There is a conditioned avoidance of certain elements—a learning to ignore some elements, and a conditioned approach to other elements—a learning to respond readily to these elements.

The Nature of Drives and Cravings

The fact that certain internal conditions act as a stimulation to general activity has led to the use of the term *drive*. It is said that hunger and other physiological conditions act as drives to general activity. There are no confusing implications in such a statement, but when it is said that the hungry rat demands food, craves food, desires food, has for his purpose or motive or incentive the securing of food, the statement may have any one of a number of meanings. It may imply only that we as observers can predict that the hungry rat will continue its general activity until it finds food. With this implication the terms 'demand,' 'craving,' etc. are only descriptive of behavior. The craving or purpose in this implication is not a force which causes the animal to secure food, not a special drive. But more often the implication is that a craving or purpose is a drive, is a factor which causes the animal to go to the goal-object. If the craving for food rather than hunger is to be considered as the cause of food-getting, the question arises as to the nature of a craving and its relation to the physiological condition. Evidently the craving for food may include hunger but is something more than mere hunger. This something more is sometimes said to be a consciousness of hunger and a consciousness that the securing of food will relieve hunger. But consciousness conceived as a cause of or drive to action is not much in favor with most psychologists. In consequence many psychologists ban the use of the terms 'craving,' 'desire,' etc. But hunger, as we have pointed out above, is accompanied by a neuromuscular readiness to respond to food. The word craving might be used to designate the physiological and neuromuscular readiness to respond to a given stimulus or object. In this sense the word designates a complex condition of the animal, not merely a visceral or physiological condition but also a neural and muscular condition. When it is said that an animal possesses a craving for food, a purpose of obtaining food, a food-getting motive, it is being said that the animal is in a state of readiness to react to food. When it is said that the craving for food is something more than hunger, it is

being said that the animal is not only hungry, but also possesses a neuro-muscular readiness for eating. In this usage the term craving is convenient, for it designates a complex state of the organism and designates something which is highly important in determining the behavior of the animal.

If this definition of a craving be allowed, the basis for the often-drawn distinction between a primary and a secondary craving or drive is readily apparent. The primary cravings involve a physiological or visceral condition, such as hunger, thirst, sex tensions, while the secondary cravings involve only the substitutively aroused neuro-muscular readiness to respond to a given object, to engage in a given activity. My craving to play golf is a neuro-muscular readiness to play golf, aroused by the sight of a course or a set of clubs, by the mention of golf, or by anyone of many other things associated with golf. It is a secondary craving, not involving any fundamental physiological condition.

Summary and Conclusions

An attempt has been made to determine the distinguishing characteristics of goal-objects, to discover the source of their apparent influence when not immediately present to the animal, and to analyze the factors leading the animal to seek them when absent.

The two types of goal objects were distinguished: (1) those *from* which the behavior is getting, and (2) those *to* which the behavior is getting. Those of the first type are simple stimuli whose stimulating value is high. Those of the second type were defined as those which are dependent for their effectiveness upon special internal conditions or states of the organism, which, after being responded to, lose their effectiveness for a period of time, and which evoke vigorous and dominant responses involving both skeletal and visceral components both of which are highly subject to conditioning.

It was concluded that goal-objects only *seem* to be effective when not immediately present and that they are seemingly

effective because the physiological condition upon which they are dependent may arise in their absence, and also because the direct response originally evoked by them may be substitutively aroused. The physiological condition when aroused in the absence of the goal-object gives rise to generally heightened activity, and the substitutively aroused direct response (a neuro-muscular readiness for executing the direct response) gives selectivity or direction to the heightened activity. The getting-to behavior may, therefore, be said to be caused by the physiological and neuro-muscular readiness to respond to the goal-object.

It seems legitimate to term the physiological condition a *drive* and to call the physiological condition together with the substitutively aroused readiness for direct response a craving, desire, wish, purpose, motive. In this sense these terms are names for the physiological and neuro-muscular causes of the getting-to behavior. When a neuro-muscular readiness for a given activity is aroused unaccompanied by a visceral or physiological condition, the readiness may be termed a secondary craving or wish.

After the animal has repeatedly got to a goal object in a given manner, a greater readiness to respond to some intermediary stimuli and a lesser readiness to respond to other intermediary stimuli is developed. This readiness to respond to only certain intermediary stimuli gives the getting-to behavior a greater directional character than that given by the neuro-muscular readiness for the direct response alone.

Finally, the author cannot refrain from remarking that this analysis of terms commonly used by 'purposive behaviorists' convinces him that the gap between them and the 'stimulus-response behaviorists' is for the most part a terminological gap. The purposive behaviorist holds that it is legitimate to infer from getting-to behavior that the animal possesses a purpose of getting to the object got to, a craving or desire to get to the goal-object. The stimulus-response behaviorist is not content to use such indefinite terms as purpose, craving, desire. He either refuses to take notice of such terms, or else he sets out to give them a stimulus-

response meaning. When he takes the latter course, he considers the motive as an internal condition furnishing internal stimuli. But the motive is, if our analysis is correct, not merely an internal stimulating condition; it is also a temporary neural organization and activity. Consequently it is no more correct to say that a motive is an internal stimulus than to say that a habit is an internal stimulus.

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AN INTERACTING-PATTERN THEORY OF THE AFFECTIVITIES

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Introduction.—In the present paper we shall describe in a positive way a general theory of feelings and emotions even though it is often claimed that affective psychology is still in the trial stage. As a preliminary to stating the theory it will be necessary to discuss the importance of conscious processes and verbal habits, the influence of heredity, the learning and retention of feelings and emotions, and difficulties in classifying the affectivities. After describing the theory a brief comment will be made on the views that affectivities are pure conscious experiences, that they are organic sensations from bodily changes, and that they are dependent upon activity in the thalamus and cerebrum.

We have used the word 'affectivity' to include feelings, emotions, moods, sentiments, and all other 'warm' psychological activities; and we have used this word partly for the purpose of distinguishing between the 'warm' activities and such 'cold' processes as sensations, perceptions, images, thinking, speaking, reflexes, and skilled motor habits. The differences between the 'warm' and 'cold' processes are of considerable importance in systematic psychology. The warm appear earlier in the development of the individual, and it is possible to establish affective habits in an infant long before any skilled motor acts and verbal organization can be acquired. The affectivities involve more bodily tissue than the cold processes, and they are more closely related to the functions of the viscera and the autonomic nervous system. They are more basic and central in the organization of the personality, and disorders in them produce a greater psychological effect than abnormalities in overt motor acts and in the mechanism of speech. In recent years the influence of

feelings and emotions on the development of personality traits has appealed with increasing strength to students of technical psychology.

The Importance of Conscious and Verbal Activities.—In studying the physiological and chemical activities involved in feelings and emotions, the human subject ordinarily gives a verbal report on the kind of affectivities that are present, and observations are made at the same time on some of the other organic functions. The logical basis and point of departure in this procedure are the conscious processes of the subject and his associated language habits. Were it not for the conscious processes, we would not know that the affectivities exist; and if no language habits were associated with feelings and emotions, any discussion of this subject would be impossible. In the method that is commonly used, certain physiological activities are found to be correlated with the verbal report of a human subject, and these physiological activities are later used as a criterion that a similar affectivity is present in some other man or woman. This procedure suffers from the fact that only a small portion of the total organic pattern can be observed. The internal consistency of the physiological criteria that have been used is low, and the experimental results that have so far been obtained on the identification of feelings and emotions in human subjects by means of 'expressive' movements are so poor that it is not yet possible to distinguish in a reliable way between any two affectivities on the basis of any single physiological or chemical process or on the basis of any group of processes.

After introspecting about their own affectivities, a number of biologists and animal psychologists have attempted to describe the emotions of some of the lower animals; and the logical basis and point of departure in the experimental investigations of the lower animals has also been the conscious processes and associated language habits of human observers. The justification of this procedure becomes more questionable as one goes down in the phylogenetic scale, and the feelings and emotions of such animals as ants and bees cannot be described when one does not even know that these activities

exist. The value of the above method increases as the anatomy and physiology of the animal in question become more similar to that of man. The psychology of the affectivities is advanced in a doubtful way, however, by the tacit assumption that the anatomy and physiology of cats and dogs, for example, are the same as in man; and since the affectivities of the highest subhuman animals cannot be safely identified in the human frame of reference, it appears that comparatively little of a scientific nature is known about the feelings and emotions of the lower animals.

The systematic difficulties which are encountered in studying the affective states of lower animals are also encountered when human subjects are being investigated, because being human is a matter of degree. A primitive man has difficulty in understanding the moods and sentiments of the more highly civilized. Many men do not comprehend the affective natures of certain types of women. Adults frequently fail to appreciate the emotions of children, and normal people are often quite unsympathetic with abnormal patients. A verbal report may be obtained in each of the above cases, but an individual's understanding is limited by his past experience, and the words do not mean the same thing for different people. Not only do the meanings attached to the names of affectivities differ in people with different language organizations, but the meanings of all of these words tend to change over a long period of time. A number of affective processes do not have names of any kind. Many of the difficulties in investigating feelings and emotions are explained and also justified by these individual variations.

The Influence of Heredity.—The most scientific data on heredity are concerned with the structural features of plants and animals; and the reason commonly given by the geneticists for the backwardness of the subject of human heredity is that they cannot breed human beings as they breed plants and animals. This backwardness of the subject of human heredity, however, is largely the result of the greater variability in the bodily constitution of human beings and the smaller relative influence of heredity on human nature.

Feelings and emotions involve the structures and functions of the body, but the germ plasm has a different influence on the development of every individual. People differ from each other in their sense organs, muscular system, microscopic structure of their brains, and in their basic chemical organization. Every anatomical and physiological feature differs in degree, and no bodily structure is inherited as a unit character. The structural differences between people cause even greater differences in function, and there are greater differences in psychology than in physiology. Inherited differences in the structures and functions of the body are sometimes the causes of marked differences in the affectivities of different people. Human anatomy and physiology are also influenced by environmental factors, and these environmental influences also operate differently for different people.

The Learning and Retention of Affectivities.—The psychological factor of learning may or may not operate in the same direction as the differences in bodily constitution to produce affective differences between different people, but the learning process is an important factor. Learning produces differences between different people not only in the stimuli and situations which call out feelings and emotions but also in the sensory, nervous, muscular, glandular, conscious, unconscious, and other activities involved in the affectivities. A person may acquire a like, dislike, or fear, and one's whole nature may be influenced by a traumatic emotional experience.

The psychology of learning has been influenced by the fact that the books on this subject have been written by educational psychologists who have greatly overemphasized the relative importance of elementary school subjects and similar learning material. The painful nature of much of the learning in the elementary school and the heroic effort and exceptional determination required to attain marked skill in athletic performances have given rise to the alleged law of exercise, and it has been erroneously assumed that all learning requires a large amount of drill and practise. Considerable time and effort are required to learn languages and skilled motor acts, but the affectivities are frequently learned in one

repetition with no effort at all under conditions that are quite haphazard and uncontrolled, and they are sometimes retained for the rest of the individual's life. Many likes, dislikes, and fears are learned so rapidly that the process bears no resemblance at all to the heroic conditions that are supposed to be present when the alleged law of exercise is operating, and feelings and emotions are often remembered so long that the alleged law of disuse does not seem to apply.

Difficulties in Classifying the Affectivities.—Numerous attempts have been made to classify the affectivities, and to make fine distinctions between feeling and affection, pleasure and pleasantness, pain and unpleasantness, and between an endless variety of organic states, emotions, moods, and sentiments. The majority of the readers, however, have never been able to appreciate the classifications and the distinctions made by a single writer on this subject. Descriptions have also been given of a few 'basic' feelings and emotions, but in due time the short list of affective 'elements' has been laid aside. No short list of affectivities is adequate for a single individual, and a list that is plausible for one person is not a fair indication of the feelings and emotions of the rest of the population.

Some of the more representative lists of affective processes include fear, disgust, dislike, annoyance, anger, sadness, despair, pity, sympathy, pleasure, delight, amusement, tenderness, affection, amorousness, and passion; but a longer and more serviceable list could be easily constructed. These and many other affective terms stand for actual processes of some individuals in the population, and it does not appear that these words exist by chance. Although each person has many different affective experiences, some feelings and emotions do not occur in a fraction of the population. There are individuals who have never experienced a persistent feeling of anxiety, and others who do not understand the meanings that the words despair and passion were intended to convey. They cannot understand because they have never had the experiences in question.

Affectivities as Organic Patterns of Interacting Activities.—

Feelings and emotions have frequently been regarded as secondary to processes which seem more clearly defined. Some writers have paid particular attention to 'expressive' movements, and it has almost been a tradition to define affective activities in terms of conscious behavior alone. Motor psychologists have claimed that emotions depend upon muscular activity, and a few physiologists have taken it for granted that emotions are controlled by the viscera and the autonomic nervous system. In recent years the endocrinologists have made broad claims for their chosen field of knowledge.

The majority of the writers on this subject have stressed the importance of their chosen field and have habitually minimized the influence of those organic processes which have not happened to lie within the scope of their own personal interest. The affectivities involve conscious activity, objective behavior, physiological and neurological processes, and physiological chemistry, and it is not desirable to become 'fixated' at any one level or in any single field. The different kinds of processes involved are of considerable importance even though it is difficult for one person to be well versed in all of them.

The theory which we wish to propose is that feelings and emotions are organic patterns of interacting activities which simultaneously involve many different kinds of processes, although the different processes may not be involved to the same degree. In addition to conscious experiences and associated language habits, the affectivities always simultaneously involve processes that are physical, chemical, neurological, endocrinological, visceral, sensory, muscular, conscious, unconscious, etc.; and the causal factors operate in both directions between each activity and practically all of the other activities involved in the total organic pattern. The sensory processes, for example, influence the nervous processes and the nervous processes influence the sensory, the nervous activities influence the muscular and the muscular influence the nervous, glandular processes influence the nervous, verbal activities influence the visceral, autonomic

functions influence the muscles, and conscious and unconscious mechanisms have a mutual influence on each other. The causal factors operate in many directions between the different kinds of organic activities, and the total interacting pattern is more complicated than is generally assumed. What is actually found in the human body is so complicated that it does not seem justifiable to assume that feelings and emotions are pure conscious experiences, that they are merely organic sensations from bodily changes, or that they are principally dependent upon some hypothetical activity in the thalamus and cerebrum. The emotion does not depend upon the bodily processes; it is the organic pattern of interacting activities.

The interacting-pattern theory seems to afford the only satisfactory explanation of individual differences in affectivity. According to the present view, the affective differences between different people and in the same person at different times are due to differences in the organic pattern of interacting activities, and the differences between different feelings and emotions in the same person are also due to differences in the organic pattern of interacting activities. In all individuals, some organic patterns disappear and do not return, and these affectivities are never present again. Other interacting patterns appear for the first time when maturity is approached, and this is the reason some emotions are not experienced at an early age. Individual differences in the organic patterns of interacting activities and individual differences in affectivities coincide exactly with each other.

The interacting-pattern theory takes account of the overlapping between the fields of introspective psychology, motor psychology, neurology, physiology, and physiological chemistry; and it does not seem to be contradicted by any experimental data. It is just as much opposed to a definition of emotions in terms of muscular activity alone as it is to a definition in terms of conscious activity alone. The interacting-pattern theory denies that any single kind of bodily structure or function can be properly regarded as the cause or condition of any affectivity.

If the present theory were accepted, there would be a

more friendly appreciation of the value and difficulties of research in several closely related fields. A physiologist would be a more reliable scientist if he realized the extent to which conscious activities and associated verbal habits are involved in the functions he is studying, and an introspective psychologist would experiment more wisely if he considered the causal rôle of muscular, nervous, and chemical functions. There would be an increase in interdepartmental research on the relations between the different kinds of activities involved in feelings and emotions, and a better general understanding would be obtained of organic functions which do not ordinarily act independently of each other in the normal subject.

The Factor of Time.—One of the most striking differences between the cold mental processes and the affectivities is that the latter generally continue for a considerable period of time. Sensations, perceptions, images, and thoughts generally last for a few seconds, but the affectivities commonly continue for minutes, hours, and days. In considering the general nature of feelings and emotions, it is not a question of whether one activity precedes another; because in the normal subject a large number of activities occur at the same time, and many of them continue to be present simultaneously for relatively long periods of time. In all of the organic processes that are involved, there is no case of a linear or concatenated series of events in which each event is caused solely by another which always precedes it in time. In an emotion of fear which continues for 10 min., for example, heart beat may increase during the first minute, and decrease to normal after six minutes; blood pressure may increase during the first three minutes, and remain constant thereafter; the temperature of the skin may be steady for the first four minutes, then change suddenly, and remain approximately the same during the rest of the period; noticeable contractions of striped muscles may be absent except during parts of the first, third, and seventh minutes; conscious affective activity may be present on and off during a 10-min. period, but the subject may think that the emotion has been present all of the time; respiration may be altered during the whole period; and

activity in the thalamus may be present before, during, and after the 10-min. period. The experimental data do not present a picture of a concatenated series of events, but rather a complicated pattern of mostly simultaneous activities. The processes which have actually been observed in the organism do not resemble the abstract concept of the simple reflex arc.

Comment on Other Theories.—(1) The present theory of feelings and emotions is one of interaction and pluralism, and it is opposed to the view that feelings and emotions can be identified with conscious processes. Conscious activities alone do not afford an adequate explanation of the presence of different affectivities at different times. Feelings and emotions are always being influenced by unconscious processes; and the almost immediate effect of certain drugs on affective processes should be regarded as a problem by the psychophysical parallelists.

(2) The usual description of the James theory of emotions is that the body is stimulated, certain changes occur, and the organic sensations from these changes is the emotion. In opposition to this view it may be said that affectivities involve many efferent as well as many afferent processes, and all of the activities involved seem to function both as causes and as results. The affective condition does not include just one bodily process and one conscious process, with one beginning when the other ceases. The sensory, nervous, muscular, conscious, glandular, visceral, chemical, unconscious, and other activities involved occur at the same time, and all or a large number of them generally continue for a considerable period of time.

(3) A different kind of theory selects some particular structure, such as the thalamus, and attempts to show that the functioning of this structure is the necessary condition of an emotion. This is not a general theory because it does not tell what an emotion is, nor does it explain why different emotions are present at different times when the thalamus is functioning all of the time. Several organic functions such as respiration and circulation are necessary for any kind of psychological activity; but perception and thinking, for

example, are not explained by saying that respiration and circulation are necessary conditions. The fundamental problem is concerned with the functions of unmutilated, adult, human subjects under the ordinary conditions of everyday life, and the physiological method of attempting to isolate the functioning of a single structure does not furnish the necessary information for a general theory of feelings and emotions. The affective processes of intact animals can only be inferred in an indirect and unsatisfactory way from correlations between the introspections and objective behavior of human subjects, and speculations about the conscious affective experiences of mutilated subhuman animals seem of little value. Some of the investigations of 'rage' in lower animals are better illustrations of laboratory technique in physiology than of valid methods in experimental psychology.

In the interacting-pattern theory which has been described above, the causal factors seem to operate in practically all directions between almost all of the different kinds of organic activities involved in the total pattern. The claim that all factors operate in all directions would be nearer the truth than the claim that only one kind of function is, or is the cause or condition of an affectivity. Conscious processes, organic sensations, and the activity of the thalamus and cerebrum are all caused by other conditions and activities in the body. The particular activities which have been emphasized by previous theories have some influence on the other bodily processes, but they play only a partial functional rôle in the total organic pattern, and they cannot be regarded as the sole causes or conditions of feelings and emotions because it has been shown that other organic activities have a direct causal influence.

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THAT WHALE AMONG THE FISHES—THE THEORY OF EMOTIONS

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The whale has a twofold distinction among the fishes: first, when seen from a distance, it looms large among them; and second, on close examination it is found to be no fish at all. Something like that I predict for the theory of emotions among the theories in psychological textbooks and periodicals.

Psychology, the science furnishing the foundation for human engineering, so young a science, need not feel ashamed of the fact that it has to cast out some humbug which has established itself within during its infancy. Physiology in its infancy had to rid itself of the theory of the four humors. Physics had to rid itself of the theory of the four elements, each "seeking" its place, if we make allowance for such unruly representatives as cork. Chemistry had to rid itself of the humbug called phlogiston. If psychology have its humbug, let it be only for a while.

A man like William James, who was a poet and philosopher combined, and at the same time had much of that large scientific understanding which was possible fifty years ago, naturally could try to lead the novelistic-philosophical psychology into the promised land of real science. But like Moses he was permitted to see the promised land only from a distance. He remained confined to his novelistic-philosophical formulations. Thus he talked much of *emotions*. With him we find Hall and Wundt and Ladd and Royce [1] enumerating emotions. And the modern professors of the science of human engineering who have received their college

[1] I mention these five names because they appear as the philosophical pioneers of psychology in J. McK. Cattell's address, 'Psychology in America,' at the International Congress of 1929.

training from those men, continue to talk as if psychology could not exist without a doctrine of emotions, because what one has learned in childhood and youth by rote one cannot easily throw off except by an intellectual revolution. And from revolutions we shrink, rightly, because they demand from the individuals engaged in them too great a sacrifice.

I did not have the disadvantage of sitting at the feet of any such brilliant college teachers of psychology; so I *can* look *critically* at emotions in the science of human engineering.

In the relatively antique psychology, that is, even before the time of James, Hall, Wundt, Ladd, and Royce, the emotions were what the word literally means, states of consciousness which broke through the surface of the soul, like small pocks through the skin, and appeared visible to the eye as bodily motions, as 'passionate actions,' as one also used to say. James made a really great advance toward a scientific psychology when he taught that we do not run because of fear, but that we are afraid because we run, that is, when he taught that emotions were certain conscious experiences *from one's own* skeletal and visceral body, and that the body reactions *had to be explained physiologically before* one began the discussion of what the conscious emotions were. However, granted that to the human engineer a person's running is indeed very important because it determines the attitude of the society around him which differs according as he runs or does not run (that is, faces his social fellows)—whether the person who runs is *himself aware* of his running or not aware of it, is of little consequence to society, therefore of little consequence to the human engineer.

Lange, a Danish physician, reasoned similarly to the manner of James and yet scientifically much more to the point. When we talk of emotions of people, so Lange said, we hint at *one or several* of exactly four bodily reactions, all of them plainly visible in their consequences: (1) Increased tonicity of skeletal muscles, (2) decreased tonicity of skeletal muscles, (3) increased tonicity of smooth muscles, (4) decreased tonicity of smooth muscles. To society each of

these reaction forms becomes appreciable in a certain variety of ways, but chiefly as follows: (1) as great activity or restlessness; (2) as pronounced inactivity or sleepiness; (3) as paling, bloodlessness, of the skin; (4) as reddening, warming of the skin; and (1) may be combined with either (3) or (4), and (2) may be combined with either (3) or (4). Whether any of these four combinations, 1–3, 1–4, 2–3, 2–4, enters the individual's own awareness is of small significance to science according to Lange, who in this respect is far ahead of James. The *methodical* enumeration, in *four groups*, of the physiological processes is Lange's claim to greatness; and it is through his conviction of the *relative insignificance* of whether the individual is *aware of himself*, that Lange, the objectively inclined psychologist, will stand much higher in the history of science than James, the subjectively inclined psychologist.

Both Lange and James were interested in the smooth muscles, or more correctly speaking, the muscles constituting the vascular system of the body, and through this interest differed from the novelists and historians who describe in their stories only the passionate *actions*, that is, the functions only of the striped or skeletal muscles. Today, nearly half a century later, a new knowledge, a third division of physiological knowledge, has forced itself upon the psychologists who follow the trend of James and Lange. The glandular activities have become better known, and especially those glandular secretions which do not flow out from the glands through ducts have been newly discovered. The secretions of the ductless glands are absorbed by the bloodstream and thus carried to various tissues in different parts of the body which are chemically qualified to utilize them. These chemical substances secreted, one by one ductless gland, another by another ductless gland—these hormones or endocrine substances as the physiologists call them—now sensitize selectively the nervous structures which innervate the muscles of the limbs, the hands and feet, now selectively the nervous structures which innervate the muscles of the trunk and cause the trunk either to be tense, straight and stiff, or to wriggle and twist,—according to the muscles involved. Other hor-

mones serve to sensitize that part of the nervous system which serves the muscles of the eyes for opening and closing, or the muscles of the jaws, cheeks and tongue for the multiple acts of biting into things, sucking things up, chewing things, spitting things out. Other hormones sensitize the nervous structures which innervate the muscles, causing our vocal apparatus to get into action in shouting, singing, speaking, no matter what names the social language prefers for these various vocalizing activities.

Certain hormones have a curious multiplicity of chemical actions. For example, a hormone secreted by one ductless gland may by sensitizing a part of the nervous system affect certain vascular muscles and thereby the blood circulation; it may also stimulate another gland, for example, the liver, to become active in its ductless parts and throw sugar into the blood to be sent to the muscles of the legs to enable the owner to run faster and keep it up longer; the same chemical may also directly prevent the muscular fatigue of the runner from setting in so soon as to discourage him. The psychologist would go out of his way if he would chemically study all these possibilities. The physiologist does that. But the psychology student should come to realize that human life is regulated in such physiological ways, and that such knowledge is vastly more important for social engineering in the social relations between man and man than Wundtian speculations on the metaphysical problem of whether the affective life of the human spirit, the life of feeling, stretches itself only over two so-called dimensions of consciousness or occupies three dimensions of consciousness.

All these three classes of physiological functions, (1) the functions of the skeletal muscles, (2) the functions of the vascular muscles, and (3) the regulatory chemical actions of the glands,—the duct glands and even more the ductless glands,—depend for their functions very largely on the nervous system. The psychologist must know something of those three and (4) must have a clear and up-to-date correct idea of how the nervous system is built by nature and how it works. Since social organization largely serves the purpose of controlling

through *formal and informal* education, habit formation, or whatever you call it, the modifiability of the nervous system which insures the making of a civilized being from the animal-like baby,—the psychology student needs to acquire a correct knowledge of those laws of nature which regulate *the modification of the nervous system*, that is, the laws of habit formation, also called the laws of learning, also called the laws of memorizing, also called the laws of intelligent adaptation, also called the laws of acquired behavior, also called the laws of conditioned reflexes.

Where then do emotions come in? At every moment of life, without exception, including even the time when one says we sleep, all those four classes of functions occur. Even sleep is an emotion,—and Lange indeed would say so, although James might not. Not all four classes need be at any moment equally strong, it is true. But none could be reduced to zero for a few minutes without seriously upsetting the health of the individual if not actually killing him. Indeed by health of the individual we scarcely mean anything else but that these functions do not unduly get out of their proper proportionality. While any one of them waxes strong, the other three can not remain on a low level. While any one is reduced in intensity by some obstacle, the other three can not remain on a high level. They do not all go up and down at the same moment, it is true. Some one may lead for a few seconds, even minutes, another may change appreciably next, another next, the fourth next. But it is at most a few minutes for all that to occur. None of them can be isolated; and to none of them can be assigned, therefore, a particular and socially significant name such as 'the emotional state of the individual.' And yet textbook writers still seek to isolate the emotional function.

Our modern psychologists, although they try to be human engineers, do not have the courage to throw off those terminological shackles which were put on their intellects when they were young students either directly by those teachers, James, Hall, Wundt, Ladd, Royce, or by teachers who were shackled when they were students of James, Hall, Wundt, Ladd,

Royce, and were made to transmit the bondage to the third generation.

In no science is a technical term introduced without a definition. It is the definition which proves immediately that the use of the term is not a yielding to poetic-novelistic-journalistic habits of a scientifically lazy reader, but that the term is needed by the constructive demands of the science itself. Now, if anybody can find a textbook on psychology in which the term 'emotion' is introduced thus honestly, and not by the novelistic back door, he can make himself distinguished as the greatest discoverer in mankind.

It is clear that the poets, like Homer thousands of years ago, when creating their rich store of language terms to describe how the soul 'expressed' itself outwardly, found it easiest among the physiological functions to describe the motions of the limbs produced by skeletal muscles and the facial distortions produced by those skeletal muscles which surround the skull and the neck. Joy thus means light but rapidly repeated, though irregular, arm movements, and also light movements of the legs, not of the running or marching type nor of great regularity. I mean of so little regularity that they could suggest no productive work like pedaling a machine, but such that they suggest the dancing movements of a hen around a worm so big that it can not be swallowed by a single thrust of the bill; or the dancing movements of a cat having cornered a mouse but not being hungry enough to start immediately devouring it; or the dancing movements of a child, just having had a full breakfast, around a birthday cake which is being put on the dinner table for consumption some hours later, at dinner time.

It is so easy to understand all that. Recall what need not be taught, since it is self-evident,—recall that the universal activities of all living things, not only animals, but plants as well, consist in three types, poetically called hunger, fear and love; objectively rather described as putting *food* stuffs into the digestive cavity or cavities; providing *shelter* from excesses of push, of pull, of heat, of cold, of moisture, of dryness; and providing for the *fertilization* of the egg cells

from which—excepting the lowest forms of life which lack individuality—the species must reproduce itself because the individuals are doomed to die.

When there is scarcity of food, no time is lost in hesitation before swallowing that which is found. But when there is abundance, then what would otherwise be a searching or hunting transportation of the body resolves itself into a mere searching, among the present, stationary superfluity, for those few food elements which seem particularly productive of adipose tissue, fat tissue, of internal food for future periods of external lack. The human language creators, the poets, have called that joy. So everybody learns in babyhood to call such dancing motions around a good thing joy. Since the human race uses its language also generalizingly, abstractedly, it soon learns to speak of joy also when the center piece is no food at all, but is merely a symbol of something often searched and hunted, or of anything prized, as when the followers of Moses, disobeying his orders, danced with joy around the golden calf, probably a symbol of prosperity.

Where can the line be drawn between biological activities which are unemotional and biological activities which are emotional,—while the hen *dancing* around the *big* worm is doing nothing with her body which is fundamentally different from *jabbing* at the *little* worm? How large must the cooky become before the child does not feel like stuffing it into his mouth *immediately*, but like *enjoying* it by prancing around it? What right do we have to deny that the smallest currant which the child puts in his mouth is, poetically, the stimulus of an emotional state? What right do we have to prescribe a particular rapidity or extent of jaw motion below which there is no emotional state and above which there is?

When many skeletal muscles of a human being act strongly and prolongedly, he can not help getting red in his face. The vascular muscles circulating the blood naturally coöperate with the skeletal muscles needing the blood supply. Also the heat resulting from the muscular activity must be removed from the body, and for this purpose much blood must circulate close to the skin surface where it may be

cooled by cold air or by sweat evaporation. But this blood circulation should not be called an emotional state simply because it is sometimes greater than at other times. How red must a person be in his face before he is said to have lost the unemotional character? Why is he not slightly emotional while taking his afternoon nap? Is not some blood even then circulating through the skin? Who draws the line between more and less flooding of the skin with blood?

We may add that no muscles could continue to work if the glands suddenly ceased to supply the internally created drugs needed by them. And that the nervous system plays its normal rôle all the while, now with greater, now with less flux, but never ceasing, is also self-evident. Who can decree that such and such an intensity of glandular and neural function is an emotional state and that below that intensity level the glandular and neural functions are unemotional? Do we draw a line but to please metaphysicians?

In a very fine and unusually modern textbook I find, in spite of its modern tendency,[2] the following examples among innumerable others of *emotional* actions: a child's fear of bugs, fear of the dark, one man's love for his work, another's self-esteem, still another's superpatriotism. But what is gained by calling these habitual actions emotions? Why not simply and systematically describe them in all the details desired biologically and stop there? How does the child's fear of the dark differ from my own fearless (?) attitude when I walk home on a lonely city street in the dark and, in passing a stranger, quite naturally assume a slightly cautious attitude, or from my own highly tense attitude when in a far-away country on a deserted highway I once was held up, but succeeded in bluffing my two adversaries into thinking that I feared them less than they feared me—almost to collapse when ten minutes later I felt safe? In none of the three cases is there absence of function of the skeletal muscles, the vascular muscles, the glands, the nervous system. There are

[2] In Dashiell's recent text one looks in vain to discover in the most elaborate index any trace of the 'will.' There is nothing voluntary, involuntary or conative left. What a horror to the metaphysician! But the 'emotional' still runs through the book like the proverbial red thread through the cordage of the British navy.

differences in the intensity of function, but since nothing is totally absent, where does the fear begin?

Why *compete selfishly* with the poets and the ministers of religion? Why introduce into science an unneeded term, such as emotion, when there are already satisfactory scientific terms for everything we have to describe? Otherwise the question remains eternally: When is an emotion not an emotion? Do I have an emotion when I look up a rare word in the dictionary, find two spellings undiscriminated and reject one in favor of the other? If I had not had 'an emotional set' of preferring one spelling, I should have been in a case as difficult if not as dangerous to life as that of the famous donkey between two bundles of hay. I predict: The 'will' has virtually passed out of our scientific psychology today; the 'emotion' is bound to do the same. In 1950 American psychologists will smile at both these terms as curiosities of the past.

[MS. received October 4, 1932]

DISCUSSION

GRASPING IN INFANTS AND THE PROXIMO-DISTAL COURSE OF GROWTH

Scientists sometimes wax a little too enthusiastic over a particular pet theory. Anxious to make the theory all inclusive they are occasionally guilty of overlooking salient facts. It appears that Irwin [1] has fallen into such a pitfall in his enthusiasm over the organismic hypothesis. In attempting to show how grasping develops from a generalized massive response to a specific localized reaction he says, "The final stages of the grasping pattern have been studied by Halverson. However, the early aspects of the differentiation have not yet been worked out. *The primary differentiation appears, not in the hand but in the shoulder and upper arm.* It is in these segments that differentiation from the total body pattern starts. The differentiation proceeds to the elbow, forearm, wrist, hand and digits." Obviously Irwin thinks that the course of grasping development is proximo-distal. He later adds, however, that, "This theory of development of behavior implies that differentiation will be found to proceed radially in the human organism from the neck and cervical trunk region generally in the same way that the maturation of the central nervous system has been found to proceed forward and back from the brain stem and the cervical region." Had Irwin considered the embryological development of the limb buds he would have realized that differentiation of the limb buds and concurrently their innervation is initiated not in the shoulders and upper arms but in the digits. Embryologically, the development of the hands precedes the development of the upper arms. If Irwin is to apply this analogy with respect to the function of grasping, and other types of behavior involving the extremities, he should expect differentiation to occur first in the digits and not in the upper arms. It is the writer's observation that such is the case. As a matter of fact the grasping of a newborn infant is localized essentially in the distal phalanges. In comparison to the strength of the digital grasp the rest of the body, even the upper arm, seems relatively inactive when the newborn infant holds his body suspended.

[1] O. C. Irwin, The organismic hypothesis and differentiation of behavior, III. The differentiation of human behavior, Psychol. Rev., 1932, 39, 387–393.

Whatever may be the course of the prenatal development of the grasping reflex, it is unquestionable that the trait has attained a high degree of specificity at the time of birth. If the development of behavior patterns follows the course of embryological development, and correspondingly the innervation of particular muscle groups, then the course of the development of grasping could not be proximo-distal. It is therefore apparent that Irwin is inconsistent in his assertion that behaviorial growth follows the same course as the development of the nervous system and in his contention that the development of grasping is proximo-distal since in the extremities both nerve and muscle differentiation first appears in the distal end.

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